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AUTHOR Burger, Henry G.
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ABSTRACT

The application of cultural materialism, a Darwinistic approach to social forces, reveals that human learning is ultimately governed by the required process of human energy procurement. This "ethno-logic" interpretation of the correlation between techno-environmental levels and human learning stands in contrast to the conventional but mistaken view that education is controlled by ideology and politics. Humans are energy extractors, just like any other organism. The more efficient expand at the expense of the less efficient. Successful techno-environmental abilities ultimately control social organization, which in turn perceptualize people's outlooks and dominating ideology. Education in turn responds to the societal need by teaching the youth of that society to perpetuate or improve the ability of that society to extract the necessary energies from the environment. Hence, environment dominates learning. Examination of foraging, mining, hunting, horticultural, agricultural, and herding cultures demonstrates the various manners in which culture reflects environmental pressures, and how the resultant societal needs are met by an educational system that responds to that particular environment's demands. The document includes a 117-item reference list. (PPB)

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"E T H N O - L O G I C"

A CULTURAL-MATERIALISTIC INTERPRETATION

OF HUMAN LEARNING

DARWINIAN ISSUES IN

EDUCATIONAL ANTHROPOLOGY

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How a Society's Livelihood-Procurement Mode

Governs Its Education

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authored by

HENRY G. BURGER

Ph. D. (Anthropology)

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0. PREFACE & ACKNOWLEDGMENTS

This material was largely prepared from 1961 through 1973, excerpted from perhaps five years' full-time-equivalent work. Yet it is being offered publicly only in 1989. Why?

There are two principal factors: the unreadiness of educational anthropology, and the inrush of a different project. First, as to the unreadiness: With its fantasy of that individual is the locus of culture, most of social science used the 1960's and 1970's for obscurantist maneuvers, such as 'educational justice,' rather than coordination with evolution, which is the fundament of biological science that must underlie human learning. Indeed, the leading education-anthropologist (George D. Spindler) was degreed in educationism, not anthropology. And he was astonished at my draft of a materialistic approach to that bare subdiscipline. Even since then, the long-individualistic study of educationism has been branching merely into such exotica as semiotics and structuralism, which present still another are a new level of static intransitivity.

Since 1961, I have been attempting to apply cultural materialism to human learning. As a 1973 respite, I returned to a diversion that had since 1958 entertained me in a casual way -- the application of cultural materialism to vocabulary. The paradigm worked! Rapid developments in computerization during this period suggested the possibility that I could publish so tremendous a work as a quarter-million-listing dictionary, alone. And so came the consummation of the first edition of "The Wordtree" (1984) and its worldwide reaction. Only then did I perceive that that word project would likely require my fulltime endeavors at least to the end of my life (!) if it were to be the first codification of process (an analogue to Mendeleyev's codification of substances via the periodic table) that I believe time will show it to be (Burger 1988). Indeed, how to use words to pinpoint ideas and solve problems, is a problem of such great interest that we have had to author a brochure (F158Au) on it. That booklet is available from the present author without charge.

Meanwhile, I was utilizing these very notes in teaching at the University of Missouri - Kansas City. The full material (Burger 1969-1988) has survived some 20 years' university teaching, although many of my original pages have been given slight updates. To my astonishment, the material even today is "radically" novel. The area is simply not theorized systematically anywhere else. When students have asked for publications on one or another lecture, I have been embarassed to reply that this approach, combining perhaps a thousand citations, is still nowhere publicly available. Therefore I began to clear out all interferences. And one of them was the nagging recollection of the undisseminated materialistic approach to human learning. Yet its manuscript of some 940 pages could not readily be edited into a finished book of the traditional (e.g., text) type without several thousand hours' additional, but essentially uncreative, prettying up as demanded by commercialism.

Yet one function of the ERIC system of on-demand reproduction is the preservation of manuscripts significant to the principles of human learning. ERIC Clearinghouse for Social Studies/Social Science Education didn't have space for 940 pages, but Eric management (Dr. C. Frederick Risinger) suggested that I excerpt a 50-or-so page crux of the argument.

I do so now, adapting it to the on-demand systems of publication. (Hence the figure numbers are not consecutive.) The entirety (Burger 1969-1988) may be considered as modernizing and correcting my Ethno-Pedagogy. First published in 1968, it has now appeared in seven formats, many of them in several printings. Typically, we have reorganized the structural (ethno-specific) data from Southwestern U. S. ethnicities (Ethno-Pedagogy chapters XXV through XXXI) into processual matters such as the constraints of agriculture. The present text is thus so different (and hopefully

more advanced) as to deserve a different name, Ethno-Logic.

Would-be communicants will find the author's latest address listed life-long in the alphabetical section of the Manhattan (New York City) telephone directory.

Henry G. Burger

Henry G. Burger, December 1988.

Founding Editor, "The Wordtree," Overland Park, Kansas.

Senior Professor of Education and Anthropology, University of Missouri-Kansas City.

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1. SOCIAL DARWINISM PRESSURES HUMAN LEARNING

Psychology still preposterously gives priority to the individual, separate from society, a reversal which we have termed "psych-posterous" (Burger 1982:59). Only after obeying social rules can the question of differences between individuals be studied -- the proper but subordinate role of psychology. Cultural change (as well as the more frequent matter of cultural stability, which includes most learning) is subject to the rules of social science, and particularly of cultural anthropology. In education, then, it is high time for what Thomas Kuhn (1970) has termed 'a revolution of paradigms.'

To provide the transmission of learning with a grounded base, the natural sciences must be connected in a darwinian way with the social sciences. Cultural materialism tries to do so. It is the philosophy that any culture-wide phenomenon can ultimately be explained by rigorous extension of natural-science analysis, as the most efficient outcome for the entire culture, even though not necessarily for any particular person or subculture. Thus, an analysis of "irrational" worship of Indic battle would require may micro-considerations, such as whether the cattle's dung burns slowly enough on a kitchen stove as to enable a homemaker to work in the distant fields. Cultural materialism is the opposite of ideological philosophy, such as invoked by the many current "rights" pressure groups (Burger 1975:107-119).

Our approach combines General System Theory with cultural materialism. We must conceptualize the human as an energy-extractor, like any other organism. Hence environment dominates learning.

Let us offer an ethological analysis of the evolution of learning systems in subhumans. Animal sensations travel through limbic (emotional) channels. Their vocabulary consists of mere interjections ("cries"). In contrast is the human evolutionary breakthrough: Man's brain has evolved an "angular gyrus" that directly connects a sight with a sound (Geschwind 1972). This situation permits naming and other types of symboling that are not mere interjection. The angular-gyrus "switchboard" enables the human to "bisociate" simultaneously two ideas thitherto filed at different mental levels. He can routinize the "bisociation" for succeeding generations by coining the combination into a new word.

Each "speaking chimpanzee" recently touted by several psychologists merely

plagiarized' the angular gyrus of its human monitor. This necessary presence of a true symboler explains why the beasts have not developed "bisociation" in the wild. Human vocabulary, like alloprimates', does include interjections, such as "Ugh!" But, more importantly, it includes descriptive (nontransitive) and prescriptive (transitive) symbols.

To emphasize their uniqueness in the human vocabulary, we may exclude interjections and adopt a nearby term: Words with meaning were termed "symbolates" by Leslie White (19591975:3). The present author therefore terms as "symbolates," the noninterjectional part of the human vocabulary. The "symbolate" permits both history and prediction, the connection of cause and effect. In this way, the human can imagine diverse possibilities, and through lengthy tradition calculate their several total cost-benefits. "Symbolate" ability is the very talent neglected by Skinnerian (operant) behaviorists (Burger 1972c).

A major effect of this symboling talent is the creation of long-range systems like the transmission of learning (enculturation). Hence education should be seen as the use of symbolates to extract and conserve environmental energy.

The most effective way to direct a person to the experiences of another is not through trial-and-error, but through symboling. It enabled the evolution of hundreds of peculiarly human talents, such as deduction and medicine. Each of these "panculturals" (Burger 1977d) has a range of possible realizations. The sum of their actualizations in any group constitutes ethnic distinctiveness, or ethnicity. For this application of darwinian analysis to human thinking, learning, and teaching, we propose the term ethno-logic. Welcome to education, Charles Darwin!

As nature has evolved from the simplest organism to mankind, its teaching and learning modes have diversified into at least six levels, as shown in the table below:

THE RANGE OF LEARNING MODES

Process	Practitioners	Example
1. Totally instinctive	P,A,H.	Spider web.
2. Pragung (Partially instinctive)	A,H.	Bird calls. Human learns first language.
3. Situational (stimulus-response)	A,H.	Pavlov's dogs salivate. Land surveyor is whipped.
4. Skinnerian (operant behavior)	A,H.	Pigeon plays pingpong.
5. Social/empathetic (monkey see, monkey do)	A,H.	Birds imitate milk-drinker. Prince's chum is beaten.
6. Symbolic/noogenetic	H only.	Schoolchild is enculturated into mathematics. Collegian learns 2nd language.

Figure R7,585: From totally instinctual 'learning,' some organisms evolve more flexible modes. -- DECODER OF SYMBOLS: A = Most or all non-human animals. H = Humans. P = Plants. (Source: Original compilation.)

This transmission of behavior patterns between generations is ultimately controlled by the culture's energy-processing modes. The influences work as follows. Wherever a human community emerges, there is a neighboring one which potentially might expand into its territory if there is a an efficiency gap between the two. The more efficient expands at the expense of the less efficient, as David Kaplan has explained (1960). Efficiency is to be measured in the interplay of the actual technology, the demography, and the environment, an interplay termed the "techno-environment."

Considering merely the system of the studied ("host") community, we find that its techno-environment ultimately controls its social organization, as Julian Steward argued (1955). In turn, its social organization eventually "perceptualizes" people's outlooks. Thus social organization dominates its ideology, as the French social historian Hippolyte Taine discussed (1870). Finally, its ideology sways its logic, as Thomas Gladwin has persuasively demonstrated (1970).

We therefore emphasize the dominance of livelihood -- the subsistence or economic system -- "rolling" over the upper sectors. The logic ultimately controls the fables offered to explain complexities--its mystique. (The opposite of such Cultural Materialism is Philosophical Idealism, which might be pidginized as: 'Thinking will make it so.') These relations may be tabularized; see Figure F357g.

HOW ANY HUMAN COMMUNITY IS STRUCTURED: A CULTURAL-MATERIALISTIC VIEW

A. NAME OF THE DOMINANCE	B. SECTOR From least to most dominant	C. NON-EDUCATIONAL EXAMPLE (one subsector)	D. EDUCATIONAL EX. (=another subsector)
[As-yet-unnamed] Effect	1. Host community's mystique	Sacredness of Indic cattle; women's beauty.	Teaching pledge of allegiance.
Thomas Gladwin Effect.	2. Host community's logic	Transitivity.	Teaching computer programming.
Hippolyte Taine Effect.	3. Host community's ideology ("Superstructure" in Harris 1988:135)	Arts.	Teaching music.
Julian Steward Effect.	4. Host community's social organization (Harris's "structure")	Politics & law.	Meeting of school board.
David Kaplan Effect.	5. Host community's techno-environment	Chernozem; horticulture; redistribution.	Vocational school. Zero Population Growth-limitation movement.
	6. Techno-environment of potentially rivalrous community.	Agriculture	Whatever learning system is used in the potentially rivalrous community.

Figure F357g: How the techno-environment of potential rivals, and then of one's own community, ultimately control social organization, then ideology, then logic, and then mystique. -- Example of how to read this chart: "The Gladwin Effect argues that any community's ideology (such as its arts and its teaching of music) ultimately controls its logic (such as the transitivity or intransitivity appearing in its language, and the teaching of computer programming)." (Source: Modernization of Burger 1975:108.)

In this table are the crucial relationships between the levels of activity within any human community -- the essence of cultural materialism. Sectors 3, 4, and 5 have long been tabulated by Marvin Harris, following Leslie White and others, and traceable to Karl Marx and others. But now they are interpreted quite differently from the Marxists (Burger 1975). Sectors 1, 2, and 6, while often hinted at in the literature, are here finally been specified and incorporated into the system by the present author.

2. ENERGY PROCESSING PROCEDURALIZES A COMMUNITY

All human societies consciously educate their young, however informally. Systems producing stable harvest surpluses socialize children toward passive compliance (Barry 1959). By contrast, hunting societies pressure them toward self-reliance and experimentation. Containing both the practical and the moral, education must flush ("track") youths toward its various societal needs. Teaching constitutes an investment (by those currently owning resources) in those youth who are selected as perpetuators of the status quo. Hence the function of enculturation is primarily conserving (conservative), not liberating ("creative") as the ennuied Yankees imagined. Thereby teaching becomes the servant of the existing power system.

This cultural-darwinian perception reverses the educational philosophy of John Dewey, etc., that the school can and should reform the larger community. Education doesn't lead, but must inherently follow, the economic structure. It may quite disregard youths' personality "needs," the obsession of an obsolete Euro-american child-centeredness. Before a society can or should change its learning system, then, there must be a change in its livelihood mode.

This paper therefore examines culture as an energy-processing system, and the effect of each mode on its transmittal of culture. As with every other factor discussed in this text, we remind the reader that any strong and unusual conditions in one sector may overwhelm the normal relationships between the other sectors of a culture. Hence every statement must be understood to include the phrase, "all other factors being held equal."

The variables of the energy-processing that constitutes the techno-environment may be divided into at least four levels, as shown in the following tabulation.

HOW A COMMUNITY'S ENERGY UTILIZATION EVOLVES

Phase	Options
1. Energy procurement	Overcropping & Domestication (to be detailed in Fig. R7,445a)
2. Energy transformation	Handicraft Manufacturing Computerization
3. Energy distribution	

	Reciprocity
	Redistribution
	Marketing:
	closed (cartelism)
	open (commercialism)
	Cameralism (communism, fascism, etc.)
4. Energy conservation	Medicine, etc.

Figure R7,445c: The phases of energy processing in a human community. (An original codification.)

The present report will detail only one of those four phases, namely, energy procurement, or harvesting. Discussion of the others appears in other reports by the present author, mostly in manuscript (Burger 1969-1988).

Now, harvest types are several, as increasing population density forces humans to increase efficiencies. And energy-procurement modes may be grouped in two types: merely parasitizing nature's gifts, and consciously controlling and replenishing them. The first is the system called overcropping; the second, domestication. But within each are at least two divisions: the less complex (inorganic materials and plants) and the more complex (animals). These permutations are tabularized in the following figure.

THE MAJOR ECONOMIC-PROCUREMENT (HARVESTING) MODES OF HUMANITY

Do people replace the removed material?	Economic Material		
	Mineral	Vegetable	Animal
No = Overcropping	Mining	Foraging	Hunting
Yes = Domestication	Recycling	Horticulture or Agriculture	Herding

Figure R7,445a: Population densification evolves more productive energy-procurement modes. (An original codification.) For the relation of energy procurement to later energy phases, see Figure R7,445c.

In a curious position stands the industrialized acquisition of fuels, such as refining gasoline and fissioning atoms. Fuel procurement overlaps with the simplest form tabularized above, that of mining. But its extraction of calories into an ever purer and more storable form suggests that we consider it with the most advanced energy-procurement modes of industrialism.

Now, no society can remain static, especially in this day of increasing diversity. Culture evolves. That increasing efficiency can be measured in the increasing output of food calories harvested per calorie invested in labor. Based on limited data, five major harvest modes were found to vary evolutionarily in production efficiency. The range was from about 10 units (in a hunting-gathering society) to 210 (in industrialized agriculture). Those figures are tabulated in figure R4,445b.

PRODUCTION EFFICIENCY BY HARVESTING MODE

HARVEST MODE	SOCIETY SAMPLED	PRODUCTION EFFICIENCY
Foraging-Hunting-Gathering. . . .	!Kung Bushmen, South Africa.	10
Fixed-site horticulture.	Genieri, West Africa.	11
Swidden horticulture.	Tsembaga Maring, Australian New Guinea.	18
Irrigation agriculture.	Yunnan Province, pre-Communist China.	54
Tractorized agriculture.	Yankees.	210(?)

Figure R7,445b. The evolution from foraging to tractorized agriculture increases the gross productivity. Consolidated from Harris (1971b:203-17; 1988:183-206)

As argued by the David Kaplan Effect in Figure F357g, high-energy societies squeeze out low-energy societies. These vast productivity differences belittle the hoary argument of the "cultural relativist" that each society deserves consideration absolutely rather than comparatively to potential or alternative societies. Hence this measurement approach threatens a fundamental of traditional, "non-operational" anthropology.

Harris's formula, used to reach the tabularized measurements, did not consider the utilization of the efficiently procured energy. But it may be invested or squandered. The recipe when used alone must be seen to measure efficiency, then, only as long as all other things are equal. Hence some additional or replacive factors would have to be added to relate energy-procurement to the more ultimate darwinian measurements, such as the population density of the occupation, and space/time: the amount of occupied territory times its longevity, which helps prove its adaptability.

The present author wonders, however, if there should not be some additional factors shown. Other evidence suggests that humans move to the next more intensive mode only when population densifies or similar pressure intrudes. This fact suggests that the really achieved efficiency is the greater total food provided, and does not guarantee greater efficiency per hour. Among the Kofyar of Nigeria, for example, intensive agriculture was found to require more effort per product than shifting cultivation (Netting 1968:127), hence was certainly not attempted for pleasure.

The saved time of the greater efficiency need not emerge in leisure and recration, as consumer-democracy legends supposed. Rather, citizens' time is in many cases channeled to increasing productivity -- to more work. The result is that the improved technologies engrandizes total output. Thereby a population can and does densify, not stagnate, in comparison with the less successful neighboring cultures. Hence recent consumerist dreams of Zero Population Growth (Z. P. G.) cannot be anthropologically justified. For the very function of human organization seems to be the constant, darwinian accommodation of ever greater population density. Such packing-down of efficiency was termed "ephemeralization" by John McHale (discussed in D. H. Burger 1966-264).

Our discussion of the several energy-procurement techniques will follow the foregoing tabulation sequence from less to greater productivity. Thus, we may begin to correlate energy-harvesting mode with learning system. Now, many and probably most societies treat both plants and animals. Yet animal targeting adds to the process of plant-targeting the complexities of wiliness. Hence the procedures, social organizations, and many other aspects of the plant processors tend to be distinguishable from those of the animal processors. We therefore reserve the added complexities of animal targeting to separate subsequent subchapters. The remainder of this report will consequently follow that sequence: foraging, hunting, horticulture, agriculture, and herding. It will devote more space to the more efficient type, namely the final three.

3. THE FORAGING/MINING CULTURE & LEARNING

We begin with the simplest energy-procurement, or harvesting, system, and its effect on enculturation. This is the foraging of inorganics, called mining, and of plants.

Evolution The taking ('cropping') of vegetation that has grown naturally rather than by conscious planting is variously termed foraging (a word that also has broader meaning), gathering, overcropping, etc. It is the harvest type that links animal and man. Virtually all vegetables and subhuman beasts procure energy by parasitizing it rather than growing it. For simple plucking is cheaper than controlling reproduction, or domestication, especially in areas (such as Eskimo) distant from control technologies.

Now, a culture must normally stay in balance with its environment by replacing the items it consumes, as by planting their seeds. Indeed, such balance between the inorganic, the subhuman organic, and the human culture is the definition of ecosystem. Exceptions may be said to occur, however, during cultural change (cf. pollution) if the group is large, and by natural replacement if the group is small. Nature regrows the destroyed or scattered seeds.

The temporary imbalance may be termed overcropping, however. Soil may be rapidly exhausted by nonrotation of crops or nonfertilization. Botanicals and animals may be gathered -- furs, hides, timber, etc. -- faster than nature cycles their reproduction nevertheless. Indeed, the present anti-pollution movement is the concession that overcropping is now beginning to occur on a dangerously wide scale in an industrial system.

That situation may well necessitate a people's moving either temporally (fallowing the land in some years) and/or spatially (as by rotating garden areas, migrating seasonally, or migrating permanently.

Livelihood Warned St. Paul, "If any one will not work, let him not eat" (Bible B. C.-A. D.:1962:Thessalonians 3:10). Similarly, he declared that "whatever a man sows, that he will also reap" (op. cit.:Galatians 6:7). Unfortunately, however, that future saint did not consider foragers whom, like "the birds of the air:....your heavenly Father feeds." (Bible: Matthew 6:26). For they survive, even thrive, without the work of sowing. And although many such societies are disappearing, their past durability is such that perhaps 90% of all humans who ever lived supported themselves by the hunter-gatherer mode. Indeed, such groups still exist within today's United States, such as some of the Shoshone Amerindians of Idaho.

The gatherer must prod the earth in the case of roots. Then he loosens the soil with a pick, and extracts the plant by a lever. All these functions are combined in a single tool, the digging stick or dibble. It is a strong stick that tapers to an often fire-hardened point (Bock 1969:243).

Overcropping societies have a very low per-capita production. This is true either because their climate is inhospitable (e. g., Eskimos, Bushmen) or because their technology is primitive -- an often related factor. The foragers lack control over their environment. Either a plant is in seed, a fruit or nut is ripe, a fish is running -- or it isn't. Persuasion and technology avail little directly. When an item is available, however, it tends to be very plentiful and easily obtainable. This 'feast or famine' situation makes the foraging society one of the globe's most leisured, yet sometimes precarious, cultures (Service 1966:13).

Association Foraging tools and weapons tend to be carried personally. But natural resources like land and even food caches tend to be communalized. Where individualized ownership occurs, it will usually reveal peculiar circumstances, like Occidental invading brokers' offering bounties to fur trappers. Hence sharing, not personal hoarding, is customary. The greedy become the butt of gossip (cf. Erasmus 1961: 113-115).

Almost anyone can discover botanicals with a little practice. All movements are public. Frequent touring reduces emotional attachment to a particular plot. Mobility prevents exclusive control over resources. Hence one rarely finds significant coteries (social or economic classes or hierarchies) among foragers.

Instead, they develop intense interpersonal relations. It is difficult for a member to refuse any request outright, for such disapproval would contravene equal cooperation.

The gathering of plant food is almost invariably the task of women (Bock 1969: 243; Service 1966:10). Hence women may here be more "productive" than men. Yet "prestige," in its public, instrumental sense, finds women almost never enjoying superiority over men. This situation would seem to contradict the extreme Marxist position that economic productivity governs social standing directly and absolutely. Explanation must be sought in the totality and career -- life-long effects of specializations due to pregnancy, menstruation, and infant care. That sum is averaged into the category of femaleness. Those time-consumers are institutionalized, destining that entire social class from birth onward, long before first menstruation. The males are considered as the more 'maneuverable' (cf. available) sex. That greater maneuverability produces the greater prestige, illustrating the relationship that we would term the Daryll Forde Effect.

But for now, back to overcropping cultures. To fit their environmental rigor, they can hardly support retardative, unproductive members. Newborns may be killed when excessive, as sometimes is the situation with twins. The old or infirm may be abandoned.

According to Sahlins, however (1972:37), hunger is rarely the case among the bulk of the foragers. Thus, two-thirds of a researched group of South African Bushmen were found to be working only 36% of the time. The balance "did not work at all," according to Richard Lee (1969:67), so plentiful were foodstuffs like the mongongo nuts. "Poverty is a social status, . . . the invention of civilization," hooted Sahlins.

Ideology The daily events that would stir divisive emotion in other societal types must be passed off with forager indifference. Hence an "atomistic" individualism characterizes such a population. Great emotional restraint and inhibition was shown by northeastern Amerindians studied by A. Irving Hallowell (as discussed in Y. Cohen 1971:353).

Foragers, added Erasmus (1961:113-15), reveal patience and stoicism in the face of vicissitudes. They disapprove overt anger. Such leadership as may emerge tends to be noncoercive. It is merely a mouthpiece, as to coordinate the day's hunting direction.

This is a type of fatalism. It is the doctrine that the occurrence of events is permanently prefixed, with humans powerless to change them. Inexpressible hostility becomes bottled up, hence emerges covertly, as in the accustations or realities of sorcery or witchcraft. On the rare occasions when conflict does emerge, the group may lack organization to mediate it impersonally. So the open horizon, ever beckoning, finds a feud-encrusted group fissioning.

Enculturation Amidst a simple technology, every young person becomes proficient over its entire range. Without a machine-stocked school building, he practices (except in a few specialities such perhaps as ritual or coitus) from his earliest years. The youth is generally eager to learn his parents' knowledge. He needs only slight encouragement to seek the prestige and pride of workmanship. In prerevolutionary Mexico, for instance, the poor peasant boy would, according to Oscar Lewis (1964:15, discussed in Goodman 1970:67-68), be put to work at age 6-1/2 tending oxen and carrying water. And at 10, he'd be hired out as a plantation worker.

Or consider the Menomini. There, mothers collected greens and ferns, hunted, and fished. All those Wisconsin woodland activities required movement freedom.

Significantly, reported G. Spindler (1963b:390), their children spent almost as much time with their grandparents, particularly maternal, as with their own parents.

Because the forager performs 'common-sense' activities like finding edibles, everyone must generally fend. The overcropper's studenthood perfectly illustrates the principle, Earn While You Learn.

The foraging student is surrounded by his curriculum. And plants are, by definition, less mobile than animals. Hence the subject matter in many areas may take little thought, just much physical activity. Thus, the Hottentot (South African) mother would show her tot "from the moment it can stand on its feet" how to dig out roots, catch and roast yummy mice and lizards, and discover wild honey (Schapera 1930, discussed in Richardson & Guttmacher 1967:157).

Elsewhere, however, considerable experience alone may enable perception of foodstuffs, as perhaps in distinguishing some edible mushrooms from resemblant poisonous toadstools. There, prestige would increase with age.

Furthermore, the value of a foraging youth depends somewhat on his abilities in comparison with those of other classes. If he is nimble, he outrank adults in a coconut-tree environment that requires climbing. But he may be inferiorized if food comes instead by shaking heavy vines, where bodily bulk may outweigh nimbleness.

Another factor is resource stability. The wherewithal may become exhausted. Cause may be native short-time carelessness; (usually Euroamerican) over-harvesting; or (as in the case of the Plains buffalo) a combination. If resources are plentiful and renewable, a learner's errors will be better tolerated than if they are scarce or nonrenewable.

The same wide spaces that characterize forager territory describe its attempts to control enculturation: The headmastership is but vague and diffused. Thus, among the low-subsistence food-gathering Pilaga Amerindians of the Argentinian Gran Chaco, the child received little status or affection. He remained, harrumphed Jules Henry (1920:119, discussed in M. Goodman 1970:53), "a hostile little flounderer for a number of years until he at last begins to take his place in the adult economic activity." Such an unfriendly outlook is, we believe, better explained by Darwinian materialism, like his caloric drain on the community, than by Freudian 'anal fixation.'

And beyond curriculum, what of the pedagogy? - The philosophy of child submissiveness so current in industrial societies probably springs from limited territory. That may occur in dense populations, as of Euroamerican cities -- or in oases like desert Hopiland. But many foragers live in plains. And so the territory accommodates them without much need for social ranking, hence without need for making their little-ones submissive.

Indeed, as argued by the Barry Effect of livelihood dominance over enculturation, the availability of simple resources tends to encourage initiative. Thus, according to Benedict (1938:1968:429), when a Mohave Amerindian was asked whether he would beat his rebellious child, he replied, "But why? He is little. He cannot possibly injure me"! And an 1840-ish interview reveals that a Crow Amerindian boated that he has just been flouted by his son. But, he reported cheerfully, such youthful bravery suggested that the whippersnapper would mature to "be a [real] man."

The semester of the foraging youth's enculturation is vague. The youth daily sees virtually the entire range of human activity. Young boys are soon given small bows or rakes. Young girls may receive means for carrying such items as firewood. The activities of food gathering generally require little adult learning, however. And so the early years emphasize subsistence values, while all years emphasize sociability and later add ritual. Here, then is cultural materialism explaining why and how the plant-foraging society transmits its culture.

4. THE HUNTING CULTURE & LEARNING

The same community that forages plants also forages whatever animals abound. But we may note some further specialization.

Definition Animal foraging is commonly termed hunting if the quarry moves through air or land, fishing if through water. Technically, all such "exploitation and utilization of wild animals (as by hunting and fishing)" constitutes besticulture (Merriam 1961:1967:208). Since animals by definition add mobility to vegetation, however, additional complexities arise for them; hunting is, indeed, catch-as-catch-can.

There is much causative difference between (hunting food for one's family) and (the defense of one's present property or agression against a neighbor). Hence man's capacity to kill in war cannot be explained or controlled by mere hunting "instincts".

Evolution The resemblances between the evolution of vegetation-foraging and animal-foraging are easily found. Several animals move so slowly that they can almost be snatched like fruit. They constitute "slow game." One, for example, is the lowly and snail's-paced animal, the snail; it has often become a food staple of humans. The chase for quicker game could easily emerge from such satisfying repasts.

Livelihood Overcropping animals as in the earlier-noted case of plants, remains cheaper than reproduction, or domestication, in areas remote from control technologies. It is shrewder of the Eskimos to let nature feed and mature each year's crop of seals than to build seal-breeding tanks atop the tundra, then daily fish out a quota.

Now, animal protein may be more nutritiously compact and complex than plant calories. But the latter don't run away on approach. According to Service (1966:10), rarely (as in the unusual case of the Eskimos) is the hunting of animals as productive as the gathering of seeds, roots, fruits, nuts, and berries.

A catch of nomadic game is usually shared, since its capture generally involves luck. By contrast, small-territory animals and domesticated animals are more likely to become private property, since skill and care are required.

Association The several types of hunting and fishing do, in accord with our microecological prediction, each produce somewhat different social organizations. Thus, hunting with traps and snares represents a small investment of labor and equipment. Such hunters cannot grow too populous. They keep splitting into subgroups, leaving the hunt to the individual or the family. (A Siriono band around Bolivia, as an instance, had fewer than 100 members.) A hunting group in a more hostile clime, such as Eskimoland, may be much smaller.

By contrast, the hunting of big herd game must be communal to surround the group and reduce peril to the individual. Hence rather permanent and wide social groupings emerge, even if realized only seasonally.

That ecological obedience was illustrated in the biennial settlement changes of Cheyenne Amerindians:- During part of the year, grass was sparse, forcing the hungry buffalo to scatter. And during those months, the Cheyenne also scattered in camping and hunting bands to follow the beats. In summer, however, grass grew lush. The buffalo gathered for mating -- the most social of activities! And the Cheyenne, who by now had specialized in buffalo as their food, clothing, and shelter, would similarly conjoin for a communal hunt. That livelihood activity produced parallel social and ideological themes via tribe-wide ceremonies (Fred Eggan, discussed in Sady 1969:60-61).

Depending on the ease of capturing a particular species, hunting societies may be egalitarian or ranked. Occasionally the quest may require special material, such as horses or fishing nets. Now, the summer Plains hunt was regulated by Amerindian police. Consequently the best kill chances accrued to the owner of the fastest horse, not the earliest or most persistent hunter. The system quickly dispossess the horseless. Indeed, the Blackfoot had to establish a welfare system, whereby the wealthy either loaned a horse, or donated meat, to the poor (Ewers 1955:305).

The essence of hunting is, then, great mobility. In most cases, its practitioners accumulate few materials. They tend to be rankless, with exceptions as noted above. The local leader tends simply to be the most successful recent hunter, for he is the best food provider. Anyone can request a food loan, but it is the better hunters who are most likely to receive the request. Hence those persons become the "big men" - the individuals who control many group redistributions. And that is an important quality in a 'paleotechnic' group whose simple technology makes luck uneven. Furthermore, a hoarder arouses jealousy, so equality (egalitarianism) tends to be the rule. Everyone tries to engage in "conspicuous giving," not conspicuous consumption.

Ideology The hunters' low technology and precarious subsistence often encourages self-indulgence in food and sex. Only if the social unit exceeds the hunting unit, the chronically famished hunter may celebrate a strike by privately gorging himself and his close family. He then enters the village apparently empty-handed (A. R. Holmberg, discussed in Bandura and Walters 1963:173).

The precariousness of life develops a special personality. Hunting generally requires great initiative. The bear does not knock on a tepee door and say, "Kindly shoot me!" Thus, the Plains Amerindian valued individual military exploits and prized aggressive and individualistic personalities (Beals and Hoijer 1965:702).

The logic of an overcropping society therefore becomes fatalism, in hunting as (per the discussion in the preceding subchapter) in plant-foraging. But hunter fatalism is a passivity, quiescence, receptive expectancy, stoic equanimity under duress. The hunter comes to accept environmental luck, yet avoids mere do-nothingness. If the proper rituals are performed, the fates will help provide. The direction of the day's hunt, for example, may be determined by cracking an animal bone (cf. "wishbone"). Louise Spindler (1962, cited in G. Spindler 1963b:360) merged those logics as latescence.

Latescence is to be distinguished, then, from mere stoicism. The Menomini had both. Stoicism enables endurance, survival. But latescence seems to be fatalism plus ego's active cooperation with the fates.

This mild activism should, then, also be distinguished from the less adventuresome traditionalism, such as the Hutterites' Gelassenheit, which is the ideology of some kinds of agriculture.

The difference between latescence and environmental controllability, or prometheanism, is easily seen. We may contrast hunting techniques between the Menomini and the Whiteman culture:-The Menomini hunted individually. The gamesman would lie near a watering place or salt lick, hardly moving day or night. One waited four days with just a pound of salt pork and half a pound of bread. On making a kill, he would quickly consume it with his family. Hence he endured a food cyclicism instead of whiteman level-out (G. Spindler 1963b:368). By contrast, the Wisconsin Yankees would divide into two groups: drivers and shooters. The first group moved through dense forest to expel the animals before them. The second group was posted at strategic lookouts. It would shoot as the animals bounded out.

The patience, painstakingness, and initiative that constitute latescence are similarly shown by the Eskimo. The male would discipline himself to lie at a seal hole for 3-1/2 days at a time. And, since the seal has acute hearing, the human had to be both motionless in the frigid atmosphere, and intensely alert to the tiniest movement at the hole where the tip of the best would hopefully appear (Dorothy Lee 1961:119). Thus techno-environment once again creates the behavior that creates personality.

Headmastership From the larger society of hunting, we may turn now to its implications for enculturation. Such a society shows a continuity between childhood and maturity. It does not require the individual to learn new occupational tasks outside the family. And since the environment becomes better known with age,

information from an old hunter is especially believed.

Studentship Students are better treated where they can make contributions or where children are rare. For instance, tots might occasionally help by throwing nets into dense bird flocks. Among the Takamiut Eskimos of Hudson Strait, Canada, children were reared under the "close and loving guidance" of their parents and campmates. They learned their roles without physical punishment by observation rather than instruction. Scolding came for antisocial rather than clumsy behavior (Graburn 1969:181).

The mobile nature of hunting discourages attention to novice hunters, who are often too small to chase or attack the more important game. Often, then, children are burdens to hunters, in contrast to systems like cultivation (Bohannan and others 1969:415).

Curriculum A hunting culture supports few specialists. Its curriculum combines cognition, affect, and (especially) sensorimotion. Thereby hunting curriculum tends to be provided on-the-job, or at least at the general site. Each hunting action tends to be quite unique: A deer charges or runs for but a few seconds within sight. Hence the hunter apprentice must learn more quickly than the student in a system, like industrialism, where every action keeps recurring.

The quarry may, in fact, be too valuable to risk to adolescent hunters. In that instance, the instructors may teach before or after, rather than during the action. Eskimo adults would go so far as to drive occasional game toward their alerted boy, so that he might take the first shot, or deliver the coup de grace. Or if he set a trap that subsequently failed, the older hands, chuckled Pettitt (1970:84), might surreptitiously reset it, or slyly fill it with their own trap catch. And Cheyenne Amerindian boys would be encouraged to follow a buffalo kill to the nearby butchering. Grinnell noticed (1923:1962:I-112) that a charitable hunter would throw them a few scraps for consumption at their own camp as a motivating memory.

From such experiences, then, hunting culture child would gradually absorb a realistic viewpoint. As Beals and Hoijer put it about Apache Amerindians, (1965:698), "much of success in life depends on the favors of the supernatural powers."

Pedagogy Hunters enjoy intense group relations. The babe therefore quickly becomes sensitive to social pressures. He rarely needs clearcut praise or ridicule. The Wisconsin Menomini, for instance, taught their children not to ask questions, according to G. Spindler (1963b:390): "Sit quiet like a stone, and let thoughts come to you. Think about a leaf in a pool." One can guess how such silence would be misinterpreted for stupidity in the question-babbling schools of suburban Waspland!

A freer rein is given youth by the hunting culture than in any other procurement mode. This is the finding of a statistical analysis of 400 societies. 100% of the eight studied hunting groups were reported as indulging the child. Of the 70 non-hunting societies, 54% offered only low indulgence. (The data were not codifiable from the 322 other cultures, according to Textor [1967:question 334].)

The free rein makes corporal punishment rare. Youths receive what we would term idle time. It may well be justifiable. For, depending on the type of hunting or warring, they may soon be risking their lives. Somewhat similarly in complex culture warfare: In World War II, the Allied armed forces provided the present author with merely canned, ground meat in support zones, but with good steak while in combat zones!

Hence learning is by example. We doubt the commonness of a father's lectures on hunting technique, one of which (among the Western Apache) was reported by G. Goodwin (1942:166).

Semester Tots can observe hunting skills at an early age. But their learning duration depends on mastery of self-sufficiency in livelihood rather than on any absolute calendar. Hence the proving of such talent wins formal sanction. Among the Ogalala Sioux Amerindians, a mother would early show her infant various game, then

gradually name those future targets (D. Lee 1958-59:1960:13). Elsewhere among Plainsmen, a youth might have to remain a bachelor till he'd proved himself socioeconomically adult, as by gaining war honors (R. Beals and H. Hoijer 1965:694). The Cheyenne demeaned a boy to herding horses until he'd burst out into his first war party (Pettitt 1946:55). And the southwestern Apache coopted the lad only after he'd bravely served on four raiding parties (Beals and Hoijer 1965:700).

Knowledge-Input System (Besinnung) In hunting, enculturation resembles adult activities. Feedback is almost automatic, although it may be aided, especially where the quarry is humans, as in militarism. Thus, ancient Sparta sought to harden ("to spartanize"). So from age 12 on, the child in that Greek culture was discharged to the field with shaven head and bare feet, in tatters and in hunger. His instructions were simple: to steal what he needed. Sometimes, added Marrou (n. d.:1956:22-23), he was accustomed to ambush by a special campaign exercise called krypteia.

Interchange between apprentice and adult becomes easier through the fact that hunting exploits are enshrined in legends. Great ethical lessons may crystallize into a lengthy poem, a saga. It combines what the complex educational system must departmentalize into civics, morality, native language, history, and religion. Thus, Homer's Iliad revealed a military prowess combining physico-technical skill and mental keenness, according to Medlin (1964:12-13).

Amidst such realism, few students would wish to become dropouts, unlike the masculine urge to quit the paperwork classroom often felt by today's slumsters. But the rarely terminated warrier might fit a special slot like that of the Amerindian berdache. That homosexual transvestite, chided Benedict (1934:1968:II-796), would instead make his career in skinning, weaving and healing.

Variation While hunters may be unable to preserve carcasses in many climates, they may be able to semi-domesticate some animals. Then the living beast becomes it own refrigerator, merely waiting to be butchered. Meanwhile, its energy is a 'field on the hoof.' Thus, Roy Rappaport (1967) found that the Maring-speaking New Guinea Tsembaga would periodically slaughter the pigs depredating their yam fields.

5. THE HORTICULTURAL (GARDENING) CULTURE & LEARNING

While the previous subchapter discussed overcroppers of the hunting type, we are now ready to consider those societies that are unwilling or unable to face the lack of mere foraging. They proceed to control the food output by somewhat controlling and protecting the food input.

Definition Here we see a controlling and protecting of the food input, by consciously planting seed or feeding the nearby, perhaps impounded, animals the sum constitutes domestication or husbandry. When applied to vegetation, it is cultivation or farming; to animals, it is herding.

As with foragers, most domesticators combine both "veggies" and animals, producing mixed farming. The proportions vary considerably with local conditions. For explanatory clarity, however, we separate herding into a later subchapter.

Cultivation may be for the benefit of the grower himself (subsistence cultivation) or for exchange with others (which, if via market, is commercial cultivation). It includes the selection of either seeds or cuttings, the preparation of the soil, planting, cultivation (tillage), and harvesting.

Broadly, then, horticulture is shallow cultivation, since the human not using draft animals or irrigation or mechanization cannot loosen the deep compacted soil. That process is described in the next subchapter as agriculture. And even today, probably more of the world's population practices horticulture than agriculture.

Evolution There are many observational stages between overcropping and horticulture. Food gathering is dependent on the collection of wild plants. Often such reaping tends to lead to site improvement, as by removing the weeds that may be

choking berry bushes. That stage is termed incipient cultivation, or protocultivation. Long before man systematically cultivated plants, the horticulurist notes that discarded seeds sprout. Yester-week's garbage dumps are now seen growing. And even slight experimentation shows that not all the garbage, but only the seed portion, produces those sprouts.

Soon such seeds may be semi-consciously dropped onto the ground surface. And the connection is then easily discovered between sun, rain, and growth. Thus, according to Childe (1952:32), the Hadendoa, nomads of Sudan, leisurely scattered millet seeds atop the annually flooded earth surface, and simple awaited the harvest.

Selecting and planting constitute cropping. (When applied to humans, this procedure, of doubtful validity, is termed eugenics.) Reducing the competition with weeds gives cultivated plants a better growing chance and more abundant yield. Hence horticulture ensures the food supply (L. White 1959:47).

An example: The wild, two-fertile-row barley grew only on hillsides, but farming was difficult at that angle. As man shielded it, however, normally destructive competition was reduced, and natural mutations accelerated--in effect, by humans' selecting their more useful varieties. There emerged a non-hulled 'naked' barley with six fertile rows and well adapted for lowland growth (Helbaek 1961:101). Such a plant or variety that is not 'natural' but appears only in cultivation is a cultigen.

When that selective planting, or cropping, is combined with tending the land, the process truly becomes cultivation. Thereby, humans create new lebensraums for other parts of nature, as by burning the countryside during animals hunts. The cultivation may be provided by periodically changing of land (in lieu of importing outside fertilizer). If so, it constitutes swidden, variously termed shifting cultivation, slash-and-and burn, roza, burnbeating, etc.

Instead of merely parasitizing occasional solar energy through foraging, then, man began a Horticultural Revolution, in which he genuinely harnessed solar energy by growing crops of types and at times and places of his choice. In the Old World, plant cultivation and animal domestication occurred as early as 9000 B. C., with mixed farming villages operative by 6000 B. C. In northeastern Mexico, experimental food production began around 7000 B. C. From such centers, the cultivation techniques disseminated elsewhere (Wolf 1966:4).

The thoroughness of early humans is seen in their development of energy sources:- Although ancient food crops have been improved by modern technology, "no significant new food crops have been domesticated in the last 2,000 years" (Bock 1969:283; cf. Bates ca. 1967:43).

Livelihood The early hunters controlled energy so slightly that they could occupy territory only sparsely. But energy-harnessing, or anabolism, has been occurring with increasing rapidity. After hundreds of thousands of years, some societies devised ways of harnessing solar energy, as in horticulture. Crops, windmills, even atom-smashers, altered man: "The Agricultural [horticultural] Revolution and the Fuel Revolution have been the two great advances of culture that have elevated mankind from savagery to civilization" (L. White 1954:1959:II-141-142). Hence the Neolithic period that saw the beginning of horticulture was able to sustain a population 25 times as dense as that of the overcroppers (Coe 1962:61).

As an example, we may consider the Bismarck Range of New Guinea Territory, which received up to 150 inches of rain annually. There the Tsembaga practiced swidden. Their sugar-sweet potation gardens produced 16 calories' output for every one invested in labor (R. Rappaport, 1967:1969:183-86). In one sense, that ratio permitted a quarter hour's rest for every minute of work.

Within cultivation are two traditions: cuttings and seeds. One may make cuttings from certain plants and set them out for reproduction. These roots and tubers tend to offer much starch and sugar, but little protein and ft. Examples include manioc and sweet potato.

By contrast, other plants -- grasses and legumes -- contain seed, which is the only portion necessary for reproductive planting. That tradition enables storage, since seed generally preserves well (Armillas 1958:I-35; E. Wold 1959:51-52). Plant crops also include bananas, pulses or edible seeds of legumes such as peas and beans, etc., versus cereal crops (wheat, barley, etc.) (J. D. Clark 1961:212). The cultivation of root-crops or vegetables is sometimes termed gardening while that of the cereals is distinguished as farming (Netting 1968:55).

Within these patterns are a vast number of specializations; tree crops, as of cocoa; vineyard crops (viticulture), as of grapes; etc. Specialization fosters permanently maintained plots, as opposed to migratory or rotated areas. Maize (corn) farming is especially popular. One reason is its adaptability, for in the New World it grows from North Dakota as far south as Chile (Driver 1969:66).

An important crop produces utility in many ways beyond mere eating. The coconut, for example, is used by Pacific islanders not only for its flashy food, but also as drink, cash crop, fertilizer, building material, charcoal, storm protection, sunshade, recreation via climbing, game via husking competition, and clothing.

The single-plant system, or monocropping, is favored by the Occident because it permits specialized machinery, etc. But the scheme is readily upset. A single enemy, such as the botton boll weevil, can impoverish if not starve its dependent planters.

Now, land contains minerals needed by plants. So some action must usually be taken for harvest continuation, especially if specialized cultivation requires special nutrients. Three alternatives were listed by Steward (1955:28-42):- The land might be left disused (the barbecho system; if first plowed, the fallow system). Or new minerals might be provided by overlaying the soil with vegetation (often by burning brush and trees, thereby better separating the minerals from the ashes), the process of swidden. [Probably this technique would intergrade with using animal products like dung, or industrials like chemical fertilizers.] And his third way was irrigation, because water conveys many minerals. Since artificial fertilization and irrigation give the effect of deep planting as they soak down, we delay them to the Agriculture subchapter below.

None of these schemes is easy. Even the swiddener finds full-grown jungle trees reaching such size that they can hardly be burned. And problems of mineral fertility may require long fallowing. Thus the Kofyar of Nigeria, practicing shifting (recurrent) cultivation and also soil-conservation techniques like terracing, still had to fallow their lands for 17 years after each 7-1/2 years' use (Netting 1968:85).

Despite the apparently large size of many jungles, then, as little as five percent may be usable at any time. From such land shortage, tropical-forest cultures tend to engage in continuous (endemic), rather than rare and sporadic, warfare (Harris 1971b:228).

Association If that is the livelihood of horticulture, what about its social organization? - Now, society may have occasionally grown complex under temporary (windfall) economies, such as produced by an unexpected, in-migration of large animals. But, with the rare exception of rich animal areas like the Japanese-Current fisheries, only its domestication of plants and/or animals enables enduring complexity. Farming thereby tends to engender village life (sedentarism) instead of nomadism, although we find many communities where each family lives on its own acreage and hence provides no centralized domiciling.

In many horticultural and other nonindustrial cultures, those who are momentarily well off economically must share with those who are not. The unspecified assumption is that access to resources being equal (as it will not be if the culture is stratified), everyone will eventually bank equally. Hence the system provides social security. Likewise, many of the differences between the Old and the New Testament, such as a change to monotheism, monogamy, etc., represent the enrichment of pastoral Judaism with relatively horticultural/villagery Christianity. Perhaps the

anthropologist should term them, respectively, the Pastoral and the Horticultural Testaments!

Horticultural technology favors the vesting of land ownership in corporate, not individual, kin groups. Such groups require the submergence of individual identity. The phenomenon also favors joint rather than individual legal liability.

Hoe culture tends to have much work for women, hence prizes them in such ways as often to require a new couple's living near the bride's parents (living uxorilocally) (Ogburn and Nimkoff 1958:586) -- at least until the son-in-law's labors compensate the eventual loss of that daughter.

The seasonality of a cultivating or herding society contrasts with industrialism's infinite repetition. A group observed by Burma (1954:10) "prefers to work moderately rather than sporadically. . . . Where [horticultural] manpower is greater than available work, haste would result in excessive idleness. . . . [And so] he stops to chat with friends, to take a siesta, and then proceeds with his work at a rather leisurely pace. Although they work long and hard under [harvest] seasonal pressures, . . . [they] seem to lack interest in steady daily output." Sociality comes first in the short-run, but we must note that overall, the livelihood thereby dominates.

Ideology Unhappy hunger-gatherers can leave their lands and bands without losing investment. But horticulturists have usually endowed some labor in harrowing their soil and developing their habitations. Life in such kinship groups requires peaceful cohabitation. One stratagem becomes extreme circumspection in daily activities. Even thoughts about taboo subjects become 'bad.' Horticulturists' close support of one another cannot express aggression internally. Everyone is expected to yield to majority opinion. Since the distance between feeling and action is slight, both are controlled. There is a great lack of privacy, as compared both with the hunters who can briefly seek it, and the impersonal industrial city. Indeed, the hoe-culturist who seeks loneliness is often accused of practicing sorcery or seduction.

Yet from the permanent coresidence accretes humanness. In fact, there is a common root in the two terms, cultivation and culture. Hence most peasants keep to their own households. Cooperative enterprise for the group's good is relatively rare (George Foster 1969:67). People dare not disrupt the somewhat precarious communal balance. This traditional attitude is seen in the comment of a small-towner in a Roman Catholic agricultural and commercial area of Colombia: "If God suffered patiently, then surely we must do likewise. We must try to conform to death. This is the reason why Holy Friday [bewailing Christ's crucifixion] is more important than Resurrection Sunday" (quoted in M. Richardson 1970:78).

The ideology of horticulture, then, obeys its weak technology. It is stoicism, the belief that man must conform to his destiny and be impassive to pleasure and pain. Such stoicism should be distinguished from the more active 'latescence' discussed as the ideology of besticulture, above. It runs halfway toward the traditionalism to be discussed as the ideology of agriculture. The citizen accepts his perilous surround as normal. "True poverty," remarked Moritz Thomsen from experience in Colombia, "is a state of perpetual crisis, and one wave . . . from an unexpected direction can and usually does wreck things" (1969:173). Similarly, in southwestern U. S. A., some Spanish-American did not particularly abhor poverty because they remembered that, according to Christianity, it is as easy for a poor man as for the rich to enter the kingdom of heaven (cf. Bible B. C.-A. D.:1962:Matthew 19:23-24). In that area, Madsen (1964:16 and elsewhere) found the emphasis to be duty and ethnic loyalty, not motivation, ambition, or success. It would encourage the postponement of entrepreneurial action, mañana. Why should the human in a static situation obey clock timing?!

Logic And so the rule or canon of stoicism is authoritative and fixed. In such societies we see the subsistential, and not merely ideological, nature of religion.

Thus, the crops of Chan Kim, a village in Mexico's Yucatan Peninsula, depended on water. And, not by accident, just 16 feet from the main well was the church. If a drought yellowed the corn leaves, the pagan shaman-priest, or h-men (plural, h-mens) would hold a three-day ritual of cha-chaac ("bring rain"). During it, all male villagers would prove their unity--by merely lying assembled in hammocks (Redfield and Rojas 1934:1962:88, 122).

And other religio-magical dependencies on the economy appeared:- Since some of the fields lay a full day's walk from the residential area, the open maize crops must not tempt theft. Hence they were believed to be guarded by conserving spirits. They additionally guarded tempestuous local maidens against phallations by their brothers-in-law. Even the calendar obeyed the maize: The greatest (vacation) feast, Day of the Crosses, conveniently occurred during the bush-withering vacation (Redfield 1950:1962:96).

That which can be controlled might as well be attributed to magic. So the rice-growing culture of Sabah, Oceania, believed supernatural harm inflictable by smearing feces on the house plants of the enemy. Consequently an argumentative child might defecate and try to rub the foe (T. Williams 1969:66).

Horticulture thereby discourages changeable schemes such as science, but fosters absolutist schemes like Platonism and Kantianism. For such intransitivity and functionalism, the natural canon is a logic of circular reasoning. In this form, something that is ostensibly being proved is actually assumed, especially in its premises. It is an example of the larger type of argument termed begging a question. An instance is seen in Kpelle (Liberian) culture: A person who confessed killing a baby through witchcraft had two pieces of evidence. First, the baby had died. Secondly, he'd had a dream about eating meat. And, according to Gay and Cole's interviews (1967:90), the self-accused would declared that the tot had perished because he had consumed the child in his dream. But how did he know it was that baby he had eaten? - Because it was that baby they'd found dead!

Mystique Being finally settled, a horticultural community must attempt to answer complex questions (such as the nature of pregnancy) that it does not yet know. The gap is filled by the emergence of mystique (such as, "A stork brought your new brother").

Headmastership Earning a horticultural living creates few or no questions. The youngster is encouraged to attempt eking various forms of the normal livelihood as soon as he wishes, without formal prerequisites. The headmasters who gladly aid him are the elders, usually kin. Thereby they combine kinship bonding, technical expertise, individual tutoring, and active apprenticeship.

In so unchanging a society, knowledge is considered permanently useful. So elders automatically win a student's respect. But their functions may be specialized. The Hopi Amerindians, for example, separated cognition-and-subsistence from affect:- The father would teach his boy to grow corn and beans, to make mortar, to tend sheep. But the clan, and particularly the mother and her brothers, would train religiously and morally. They would chastize the quarreler, the lazy, and the sheepskin-bed-wetter. Since every adult was in a clan, fathers were not exempt, but merely deflected discipline onto their sisters' children. A child's 'ceremonial father' would instruct him in ritual and myth, then sponsor him for secret-society initiation. Hence the Hopis diffused discipline: instruction came from the father, scoldings from the mother's family, teachings and punishments from religious societies, rewards and punishments from the super-naturals themselves (Havighurst 1968:5-6).

Even where some complexification separates enculturation from the family, discipline is often supernaturalized. An example beyond the Hopis appeared among West Africa's Poro (bush) schools [perhaps a reaction to nearby European imperialists-H.G.B.]. They flourished among such tribes as Mende, Kpelle, Krima,

Gola, and others (M. Watkins 1943:668). In one such school, several instructors would hide in different parts of the camp. They would blow sequentially on their cowhorn megaphones. Thereby a single spirit seemed to be darting through the air, and the students were awed (Kenneth D. Little 1951:1970:212-25).

Studentship The horticulturist's emotions are gradually diffused from a narrow family circle through many strategies. He might as a youth be extruded from his small kin unit to a different part of the extended family. He might undergo a shocking pubertal initiation. And/or his rearing might be assumed by the wider kin group. Thus, the Bush-School enrollee would leave his home anywhere from age five to 15.

Curriculum A horticulture expects continuity rather than change, hence normally makes little or no formal effort at inculcating the prevalent practices and beliefs until and unless there is an initiation training. When adults are asked how children should be or are raised, they often look blank or advise platitudes like, "To respect the elders!" Or they simply relate their own childhoods in unsorted detail. Thence C. Hart concluded that "if there is a cultural tradition for preschool education . . . . then the average native in a simple society is completely unaware of what it is" (1963:406).

More exactly, however, the present author believes that cognitive matters may not be formalized in horticultural pre-adolescence, but surely affective and motoric ones are, as via the extended kin who criticize a child's poor manners, and the many other example appearing in this subchapter. And that is indeed enculturation. Thus, Guadalcanal (Solomon Islands) children were bombarded with admonitions from the responsible adults about property care and generosity (Hogbin 1964:33, as discussed in Bock 1969:60).

The hoe-culture curriculum increases in quantity and quality with student age. Among the Liberian Kpelle, a young boy or girl had to chase away rice pests, the small weaver birds that ate much of the crop. He would also be sent to the river to fetch water, and asked to bring wood, feed a fire, weed the rice, even help harvest it. Still later, he would help build houses, cut bush, clear a trail, if a boy; beat rice, plant a farm, and cook, if a girl (Gay and Cole 1967:16).

In the Bush (Poro) school, the first activities concerned visibilizing initiation marks. Both sexes were scarified. Then the boys were circumcised, and the girls given a cliterodectomy.

Thereafter rigorous forest living replaced the ceremony. The student would make a farm, hunt, and otherwise imitate villagery (op. cit.:IV). He would learn many aptitudes: arts, crafts, lore, wrestling, climbing, and other games and sports, even musical instruments (Watkins 1943:670). Poro taught, among other things, blacksmithing, medicine, carving, weaving, drumming, tailoring, and diving (Gay and Cole 1967:IV). These reports of this institution (probably present only in imperialist-threatened regions) seem to disconfirm C. Hart's argument (1963:414, 421) that initiation-school curriculum everywhere neglects basic economic skills.

The technological learning would, it is true, depend on how long he could afford the tuition. It might range from making raffia clothing to building bridges. And socially he would be learning such items as acrobatic somersaults and songs (typical verse: "The enticing waists of the women have sent me crazy!"). Tuition varied widely, perhaps averaging $3 a month (Little 1951:1970:212-25).

Only at the very end of the schooling did the child receive training in Poro sacred mysteries, such as the nature of the masked monster-spirit, and the (human) source of its accompanying music. An accompanying threat noted that its disclosure would kill the young initiate (Gay and Cole 1967:IV). The present author is reminded of how he was presented with routine warnings atop the Top Secret material he was developing overseas the U.S. armed forces.

So the horticulturist educates for stability, not for 'progress.' Among the Kpelle, there were few occasions for counting beyond about 30. A larger amount would

be indicated by a simple round number like 100. In one experiment, a product of three years of Western-type schooling surprised Gay and Cole (1967:42) by having forgotten the number '73.' But the present author's darwinian approach makes us wonder what he might have 73 identical units of, hence why he should know the number in the first place!

So the system feeds itself both nutritionally and ideologically. Studying that rain-forest society's assumptions, those authors (op.cit.:89) sadly concluded that "knowledge is the ability to demonstrate one's mastery of the Kpelle way of life. Truth is the conformity of one's statements and actions to that way of life." They neglected to mention that Kpelle culture had already outlived most of the Euroamerican societies to which they themselves belonged.

When we view hoe-culture curriculum more broadly, we find that its foraging-surpassing efficiency requires the emergence of very few full-time specialists: those who practice magic and/or health, perhaps dispute mediators, and others. They win special instruction.

Native seminaries in New Zealand and the Society Islands divided the curriculum into terrestrial learning ("Lower Jaw"), such as of crop cultivation, and cosmology ("Upper Jaw"). Indeed, Luomala (discussed in Herskovits 1948:324) termed them "primitive universities." But they were probably exceptional. For horticultural curriculum usually inculcates the only modest amount of technical and ideological knowledge that the average elder already knows.

Pedagogy Hoe-society teaching techniques tend to be simple and to deemphasize cognition. We may quantify this matter. The Hopi's educational time-budgets were compared with those of the industrial Yankess, both groups aged six through 16, by Havighurst (1968:9). He found major differences in religion (Hopi, 20% of schooling time versus Anglo, 0%). Similar contrasts occurred in the teaching of kin relations (10% versus 0%, respectively) and subsistent crafts such as sheep-herding for boys and home-making for girls (35% versus 0%). Yankee shortfalls were, however, compensated with cognitive skills such as arithmetic.

But each culture formalizes only parts, and different parts, of its activities in schooling. Hence such a comparison should include analysis of those two societies' homebound activities also. We doubt that Angloism really teaches zero percent livelihood. Perhaps a fairer statement would be that U. S. culture taught about subjects, through cognitive approahces like lecturing, whereas Hopiism taught the skills directly motorically and affectively.

Consider, for example, the Amerindian use of the bogeyman:- Each village had a corps of supernaturals, or kachinas. On periodic public evaluation of each Hopi tot, they would give the good ones a cornflower biscuit, or piki, as well as bows, arrows, and dolls. The bad would be thrashed. Thereby the children would learn such rules as not to wander outside the settlement (op. cit.:7).

A major horticultural pedagogy is, then, mimesis, a sort of look-and-do imitation. One identifies with and models himself after older siblings and kin. In Wogeo, northern New Guinea, for instance, clearing the bush excited children so much that the men had to leave young saplings for them to hack, first with worn knives, later with small tomahawks, according to Ian Hogbin (1946). No "school-doggling" there!

The young Kpelle had little choice, as illustrated by the swallow-or-choke alternative offered when he was first treated to food beyond milk:- Cooked rice-water was poured down his throat while his nostrils were pinched closed and his limbs pinioned between his mothers' legs. As the tot grew, excessive curiosity or questioning would elicit a beating (Gay and Cole 1967:15-20). In a similar vein, when an Arizona Anglo teacher asked her 33 [horticultural?] Mexican-American fourth-graders to make three wishes, only one could exceed a single dream: "The whole idea of being given an opportunity to . . . speculate, is alien when one comes from a background. .

. which depends upon day to day existence . . . where hope has been constantly denied" (H. Wilson 1968:7).

So the horticultural youth matures with much apprenticeship but little cognitive verbosity. He is rarely told directions explicitly, verbally, or abstractly. He is instead expected to watch concrete lessons. Instead of auditing lectures on farming, he observes until at some point he is told to join in an activity. If he errs, he is urged to retry. There is no punishment unless the error is expensive or foolish.

As along as darwinian and malthusian pressures do not diectly threaten the society, it maintains its repetitiveness. "In Kpelle society, facts are closed to an empirical test and to the influence of the outside world" (Gay and Cole 1967:90). Each part of the tradition justifies the whole. What is unknown is destined never to become known. Therefore knowledge is believe relatively uproductive. Knowledge-transfer, what we would call interdiscipline, becomes unnecessary.

Semester The duration of the slight horticultural learning is almost lifelong, but it gradually decreases in intensity as a maturing youth fits his environ. In Wogeo, northern New Guinea, subsistent orientation commenced at just a few years. To anthropologist Ian Hogbin, one proud father thumped: "She's just been weaned, you see, and now has her own [vegetable] plot. . . . She's far too small to do any of the work. But her mother and I will say to her, 'This ground is yours,' and she'll soon understand."

Again, the southwestern U. S. A. Hopi Amerindians gave children their first initiation into the kiva, or underground ceremonial room, between ages six and 10. The revelation that the kachinas were mortal, not heaven-sent, was accompanied by a memorability whipping. A more significant initiation occurred at girls' puberty and, for boys, around 15. Then the clan's religious mysteries were revealed, and the lads were assigned initial ceremonial roles. Thenceforth the child was an adult (Havighurst 1968:7-8).

Horticulture's few professionals find no institution to certificate them. Hence they must win gradual acceptance. Among the Tapirape Amerindian cultivators of central Brazil, shamanism aspirants gathered in the plaza each dry-season evening to solicit dreams. The novice would avoid baths, coitus, and some foods, He would smoke his mentor's tobacco pipe deeply, until vomiting violently into unconsciousness. Under such conditions, dreams were indeed likely [rather like the fasting vision-quest of some North American Indians - H. G. B.]. The process was repeated for 2-1/2 hours a night. The rigor of that plaza school caused many dropouts. If one would survive several seasons of attendance, he would begin to perceive forms while unconscious, and to be able to discuss them on resuscitation. Gradually village sicklings would call him for doctoring jobs. And if successful, he would slowly build his shamanistic clientele (Wagley 1943).

In sum, horticultural enculturation is relevant, but not necessarily easy. Those who complain of the intellectual rigors of Euroamerican schools should reflect that the Bush School was literally a turning point in life. "Weaklings, freaks, and homosexuals do not return. . . .," murmured Watkins (1943:672). The natives feel that those who cannot endure the test," "are no loss to society."

Knowledge-Input System The closeness of horticultural settlement and field facilitates feedback between learner and community. In contrast to the consumerist (especially Anglo) child who today flees adult work, the Tale (Ghana) child was keen on it: "We want to hoe because we want to be among the men and help to bring in more food" (quoted in Fortes 1938:44-48). Cooperation meant association with adults during socially productive work and so feeling worthwhile.

The Bush School graduation consisted of donning not a black gown (as on an [Anglo's] white body), but white clay face-paint on a dark body. The child would wait in a thatch shelter for a few days until it wore off. Thereupon his entire age-grade was washed, given new names, freshly garmented, and returned to a village dancing and

feasting. The new graduates would look on soberly (Gay and Cole 1967:IV).

And horticultural stoicism encourages feedback throughout life. In Old Oraibi, Hopiland, winter evenings found men going to the recessed hut with their sons. The oldsters would there reiterate the legends amidst ceremonial songs and dances. They simultaneously transmitted morality and civics (Sekaquaptewa, in L. Udall 1969:5).

By these means, horticulture renews itself. Such simple gardening tends to conflict with a surrounding, emerging state system. The latter gradually chokes off its local competitors. Thus the bush school in widely different enclaves had had a duration of three or four years. But the Liberian state government greatly shortened it (Gay and Cole 1967:17-18). And by the early 1950's the Mende term lasted for only a few dry-season weeks (Little 1951:1970:212-215).

6.THE AGRICULTURAL CULTURE & LEARNING

One variant of seed cultivation is so important as to require special consideration. While hoe-culture is breaking or otherwise modifying the soil superficially, agriculture does it deeply. The depth may be attained by a plow of wood or iron drawn by cattle, or by considerable irrigation.

Hence agriculture entails in many cases combinations such as water-lifting devices, regular manuring, crop rotation, transplanting, intercropping, threshing, etc. (Forde, discussed in Bock 1969:288). Intercropping itself offers many variants: producing different crops either by alternating time ('catch-crop') or space (alternate rows), it produces an interculture.

The irrigated fields may be termed chinampas. A particular type of irrigation retains the flow-through feature but replaces the soil floor with nutrients artifically dispersed in the fluid. Such is the soil-less planting termed hydroponics, and it is an increasing characteristic of some mass-production systems. Indeed, the massification of agriculture, or agri-business, makes that activity resemble industry more than farming. Consequently this paper mentions industrialized agriculture only briefly; it is better reserved to a discussion of energy transformation rather than energy procurement.

When the genetic structure of the seeds is itself changed, not by selection but by internal alteration as from xray bombardment, we have genetic engineering, which might also be left for industrial study.

Evolution Horticulturists are forced to experiment with deeper soil modification and so with agriculture not by curiosity but by the malthusian pressure of growing population. The reader will remember from our earlier figure that gross productivity increases, enabling greater occupancy, but not necessarily mere unitary efficiency. Cultivation has probably been practiced by some humans at least since 8000 B. C. But the New World tended to confine itself to hoe culture. The Old World, in contrast, had large draft animals, and early developed agriculture. Hence it evolved the more complex ecumene based on cereals, dates, vegetables, and livestock (Robert Adams 1960:274). Otherwise, Iberian Columbus's discovery of the New World might have been reversed!

The plains of Mesoamerica and the U. S. Midwest had a grassy web that had long frustrated the digging stick. Indded, Amerindians may have farmed as little as one percent of farmable land before White contact. However, the European's (and especially the Spanish) plow broke through to the rich soil below. It thereby enabled the densification of human settlement (Eric Wolf 1959:61). It is the potential for such darwinian utilization-increase, rather than differences in I. Q. scores, that makes inevitable some sort of invasion -- in the North American instance, by the Europeans. This Kaplan Effect belies the cultural-relativists' argument that each culture 'deserves to stay as it is.'

A similar recent conversion was seen in West Africa's forest zone. People had

been cropping yams, coco-yams, and oil-palms. Those annual botanicals were grown in island-like farmlands surrounded by the 'sea' of forest, which prevented erosion. As one soil was emporarily depleted, the Ghanians would shift cultivation to another.

Recently, however, those annual-cycle crops have begun to be replaced by perennial market crops, especially cocoa, which grows in groves of cacao trees. To exploit their continuing investment, settlers truly settled. A tremendous demand for land arose. The intervening forest began to disappear. With it went the rainfall, humidity, and shade needed to prosper the cacao trees (W. Ward 1954:1968:138).

Horticulturists divert natural water (such as a mountain stream) to the area where sprouting occurs best, such as their most fertile land. And that begins irrigation. Now, water maneuvering requires a vast labor investment. Thus, the change; from dry cropping to wet cropping requires irrigation canals.

In Madagascar, we see its effects: There the Tanala had long farmed by dry-rice cultivation. But the practice had exhausted the land and periodically driven villagers deeper into the jungle, over a day's journey. Those distant fields developed separate households, fragmenting the joint families.

When the Tanala ruined land fertility, they simply had to adopt the more laborious wet-rice system to accommodate the densifying citizenry. Thereby they could utilized previously barren land. Informal villages, democratic and individualistic, slowly transformed into stratification, with a king, settlements, and warfare. The permissive family faded into authoritarianism. The joint family organization gave way to a group of landowners. An irrigated ricefield could be tended by a single family, so its head no longer had to share its produce with non-laborers. Since wet-rice methods replaced the nutrients through irrigation, households could permanently settle into villages. Thereby the deepened their site investment. Now only the single landless household would relocate.

The migrants were crossections of the original lineages. So each original village engendered a group of descendant villages, surrounded by its irrigated fields. Since the new villages worshipped a common ancestor, village isolation disappeared, and intermarriage arose. Independent villages faded into an emergent tribalism. The improved land was carefully retained, engendering socioeconomic distinctions and classes (Ralph Linton, discussed in Robert Adams 1960:278). The labor investment justified the defense of the wet-rice village, so armies arose. Menial irrigational labors could be done by slaves, so capture and trade emerged. And to control the scattered settlements, the situation was capped by a king and kingdom (Linton and Kardiner 1952). Horticulture had become agriculture.

Thus agriculture produces greater gross energy return than horticulture. We doubt that that is more efficient per man-hour. Rather, its adoption is often necesstiated by an increasing population densification. And the latter condition usually entails the utilization of poorer, more distant soil than thitherto -- as well as the harvest being distributed to more mouths. Hence the change to agriculture may actually produce less net efficiency, since the basis for determining efficiency is simultaneously changing.

Livelihood Noting how one system may evolve into the other, we may now study the structure of survival. If land is relatively plentiful, hoe culture is often more productive than plow culture, for reasons just explained. Hoeing needs much time and labor, but little capital. Its hand operation selects soil of the greatest fertility. By contrast, plowing often requires relatively flat, treeless and rockless land. The draft animal uses straight pull; hence the land is of mixed fertility. In all, the gross plowing system needs more capital and hired labor, and is by no means more cost-beneficial than horticulture (Oscar Lewis 1951:129-30). Among the Kofyar of Nigeria's Jos Plateau, its justification came instead from enabling the use of animal 'machines' to dig deeper and faster, thereby to enable livelihood for more humans (Netting 1968).

In contrast with shifting cultivation, Bender (1969:1188) found clear differences. The shifting yields little per land-unit but much per labor-unit. It lends itself to group control over land, large households, and large settlements. By contrast, intensive cultivation, approximately equal to agriculture, yields much per land-unit but little per labor-unit. When combined with dispersed housing, it enables farmers to live near their plots, and fosters sexual labor specialization and individual rights in land.

Most of the world, then, welcomes agriculture as a sponge for its rural population growth. But Euroamerica has been mechanizing, with the curious result of forcing ruralities into the overcrowded cities. By the 1970's, the agriculture in a dozen complex societies employed less than 15% of the economically active population. And the United States, feeding both its own 200 million mouths, and through surpluses a foreign 160 million, had a population whose farming component was less than 6% (Toffler 1970:16).

Association The hoes of horticulture require little muscle power, keeping men and women fairly equal. Not so the plows of agriculture, maneuvered in part (sometimes entirely) by humans. If cattle are used, those large beasts also require human muscular maneuvering. The result of such "man-handling" is a premium on male strength, and generally more prestige for males.

The intensive agriculture produces small household production units, according to Netting's findings (1968:227) on Nigeria's Jos Plateau. Since frontier homesteading requires a strong back, it ill behooves extended families, which include the aged. Rather, an "empty" wilderness favors a decentralization for the breeding of nuclear families. Hence an excellent ecological fit was created for North American immgrants by such legislation as the U. S. Homestead Act. Taking effect in 1863, it qualified a settler only if his prior ownings were under 160 acres. Then his five years' residence and proof of cultivation were required; he could not hold the land for mere investment. Rules allowed acquisition of 160 good acres (or more if poor quality) of Western public land for a mere $15. Thereby over 1,600,000 settlers claimed 270 million acres (World Almanac 1985:441).

Such an arrangement seems "obvious" to Yankees, but not to many others in the world. One might contrast the encomienda system used by Spain to colonize parts of the New World. To the nobleman-explorer, it granted a large block of land together with the land's resident Amerindians. He could work all as one unit, or subdivided for his European tenants. What a hierarchical difference the encomienda system would have made if adopted in Anglo North America in lieu of the egalitarian homesteading system!

At any rate, agriculture requires a heavy investment of labor. Hence its emergence favors a stable polity so that its farmer may expect to bequeath his improvements (M. Wax 1971:17). The groundwork for resource restriction appears in inheritance restriction. And the harvest mode in many societies showed close fit with such stratification:- Restriction on resources could be graded through four degrees of descent system, from no restriction (= cognatic descent) through unilineal descent, dual-class, and complex-class stratification. The complexity of harvesting mode was rather proportional. Of 797 agricultural societies measured, 89% of the decile most dependent on hunting/gathering had cognatic descent, 11% unilineal, and 0% dual or complex stratification. But of complex society--the decile least dependent on the simplicity of hunting/gathering--the four categories of inheritance systems respectively appeared in 7%, 35%, 34%, and 24% of the societies, to total 100%. Thus greater subsistence productivity needs were evolving more stratified societies (M. Harner 1970:83).

Ideology Agricultural stability facilitates the development of differential wealths. Yet its potential population will, amidst a uniform ecology, create the counter-action of some degree of equality. The result will sometimes be agrarianism,

a superficial or deep democracy of treatment. But if the economic structure is rigid, the success of one farmer will be believed to come at the expense of his neighbors, as if the community constituted a zero-sum game. Agriculture must idealize the combination of laboriousness and repetition.

Thus, traditional China required its relatively few students to prostrate themselves before entering a classroom. It chief furniture was the Table of Confucius, "the very holy, very perfect teacher of 10,000 generations." They learned without understanding the archaic language. It was a splendid way to develop the memory, especially visual. But, protested Lauwerys (1963:259), it caused "complete atrophy of . . . . observation and reasoning." So, whether agricultural students are from lower class and in the lower academic classes, or upper/upper, enculturation tends to be a ritual for accepting the traditional round of nature.

Does this fixity cause numbness -- or rebellion? Many studies suggest that the world's farmers, especially of the younger generation, would like to flee to cities. They are titillated by travel--personal or vicarious as shown through the mass media. Thus, ex-farmer soldiers visted glamourous cities like Paris, then were demobilized after World War I. Sam M. Lewis and Joe Young sang, "How you gonna keep 'em down on the farm # After they've seen Paree?" Yet that situation may not encompass the already industrialized but stratified cultures. Studies of general farm laborers produced two reports (discussed in Pettitt 1970:142) showing that their job satisfaction exceeded that of all industrial workers below manager-grade. Agriculture may be monotonous, but its ideology seems "natural."

Logic The logic of a cultivation society is, then, the biological model of the life cycle, derived from the individual plant. It allows for a slight but hopefully steady yearly increase. That logic is an organic traditionalism. It includes patience, full resignation to God's ways as evidenced by seasonable or unseasonable weather. All of this was termed Gelassenheit (German, 'calmness') by the Hutterites, the Anabaptists of North America's northern Great Plains (Huntington 1970:212). This traditionalism is to be distinguished from inability to regularize -- the horticulturist's logic, which we termed stoicism in a preceding subchapter termed stoicism.

Under such stable traditionalism, we would expect that logic further to emphasize the fit, the relationship, the holism, of the environmental parts. It would neglect their separability or separateness. Such a viewpoint would condition the citizen to gaze, for example, on a meeting house as a semi-religious unit. He would not perceive it as having removable chairs, or artwork resembling the shadow of a peculiar tree a mile away.

In this connection, one remembers the curious conceptual findings of Rosalie Cohen (1969:855) from Pittsburgh student groups vaguely described as low-income. (Unfortunately, she did not quantify her two contrasted subgroups as to class, ethnicity, experience, etc. One group perceived verbal and printed tests more "relationally" (i. e., contextually), less "analytically." For example, the Witkin Test of Graphic Field Articulation found the high analytic pupils finding many simple geometric figures, such as triangles, within the complex one that was presented. But the high-relational pupils perceived few.

Curiously that sociologist made no attempt at environmental explanation. However, our cultural-materialistic approach readily suggests one: Let the testees be divided by degree of closeness to a life of traditionalism, such as a stable agriculture. Those ranking closer to that experience might, for example, be rural-migrant whites, or Afro-Americans. Then they may be expected to have that greater "relational" conceptualism. By contrast, those closer to the mainstream industrial Yankeeism, such perhaps as lower-class white families working in the fluid occupations like truck driving, may be expected to display the greater "analyticness."

Mystique Hence the system's closedness causes unusual events to be attributed to

some internal malfunction rather than to a movable boundary. "Whereas Western medicine is very concerned with providing an accurate diagnosis of a complex of symptoms derived from the germ theory of disease," observed Shiloh (1968:243), "Middle Eastern medicine is essentially concerned with ascertaining the cause . . . based upon . . . the evil eye . . . ." The villagers was believed the trouble to lie within.

Headmastership If agriculture fixates its practitioners, we may expect similarly in its enculturation. Let us begin with the system superintendency. The 'dirt-farming' agrarian tradition probably forces the instructor socially close to his student. Especially is this true when we contrast stratified apprenticeships, medical schools, etc.

And agricultural communities compartmentalize life less than urban communities. Hence the farm father is home during more of a child's waking day than in, say an industrial situation. He is available to do much of the child's disciplining. By contrast, industrial, and expecailly Anglo culture, finds the mother both punishing and loving, to create the ambivalence called "momism."

But the principal superintendent is the crop itself. Thus, a southwestern German village harvested its wine-grapes every October. And the harvesters included children. Consequently, one of the year's longest school-vacation periods occurred not in July as in the U. S. A., but in October (R. Warren 1967:8).

Irrigation and crop conditions similarly determine place of residence and intensity of field work. Hence Rock Point Boarding School (Chinle, Arizona) had to add two to the usual categories of student: "day boarder" and "walk-in" (W. Holm 1967).

Studentship Traditional agriculture informalizes most education. Among the Hanunoo of the Philippines, for instance, a girl would spend ages seven through 11 learning to weave mats, produce homespun yarn, cooking native dishes. She would by 11 be only part-skilled in tailoring and embroidery and constructing a loom. Meanwhile, however, she was improving the social aspects of her future livelihood by grooming:- trimming her eyebrows, oiling her hair, beading her wrists and ankles, and seeking vetiver roots as a sachet for her bed blanket. By 11, she would be tending some smaller tots. And after they would fall asleep, she would practice weaving a betel basket or repairing a torn blouse (Conklin 1960:1970:243).

Many agricultural and other developing societies offer full primary education to only about 30% of their children. Of those graduates, only about a tenth, or 3% of the chronologically eligible, enter secondary school. And of the few completing that level, only about a tenth, or 0.3%, receive a university education.

Among India's landowning and farming Rajputs, tuition for boys varied from 6¢ a month for the first grade to 46¢ for the fifth. Girls were not charged, for "the villagers would not pay anything to send their daughters to school" (Minturn and Hitchcock 1963:298).

The U. S. agricultural sector was a paradox. Its migratory farm workers, quite distinct from its stable agriculturists, cried in the 1970's for more education for their children. Yet Pettitt (1970:142) did not think that a cure-all, after considering the recent past: "By overeducating those who would be happy to start a career in agriculture, they are made unsuitable for the job. Then, in order to harvest crops, citizens of neighboring countries were [necessarily] imported. . . ." Few other cultures could afford such un-/sub-/super-/re-/training.

Curriculum Agriculturist subjects of study tend to be parochial in both the good and the bad senses: limited to but intense in the immediate parish. Thus, seven-year-old boys in a north-central Missouri Amish settlement were working alongside their fathers with large and "dangerous" sawmill machinery. Girls of the same age were tending both poultry and the younger children (Ballard 1970).

Most adults of the 70%-agricultural Philippine Hanunoo spent their lives within six miles of their birthplaces. Yet their breadth of practical knowledge was great.

And that adult spread was intuitively grasped by the child. Thus, a seven-year old girl was considered normal in rapidly sequencing a discussion of (1 care of her younger sister, (2) cotton-spinning, and (3) contraception (Conkin 1960:1970:236).

India's farmer Rajputs conducted their village school on the open temple platform. The children sat on the ground under a large tree. The first two years taught reading and writing, numbers, multiplication tables and simple arthimetic. The second year also added art. The third added history and civics. Geography came in the fourth and fifth grades. Sexual differences began in the third, with boys also learning farming, while the few remaining girls studied sewing (Minturn and Hitchcock 1963:297-98).

The localism of farming curriculum is nicely seen in a textbook used for religion-and-history by the Old Order Amish of the U. S., and especially of Pennsylvania. Three of its pages (Zook 1965:31-33) were devoted to the life of what many Euroamericans would call a global figure, Jesus. But eight (op. cit.:89-96) were spent on "Mennonites and Amish in Pennsylvania."

Agriculture emphasizes acceptance and concord. Korean schools, according to D. Adams (1960:1968:507), developed the passive personality, which avoids "change and discord . . . by finding and developing problems . . . in his works of art, in which he so often chooses . . . the essential harmoniousness ofthe universe." And other avoidance of heresy is seen in the fact that, as recently as 1925, the U. S. state of Tennessee convicted a teacher (John T. Scopes) for having favorably discussed a theory, evolution, that argued against world fixity. Indeed, that state ban on darwinism continued until 1967, by when industrialism, itself a change agent, had become important in 1967 (T. Linton and J. Nelson 1968b:511).

Pedagogy Deduction is the inference from generalities already accepted to particulars, from wholes to parts, from principles to new situations. Hence it thrives in closed and settled societies, often including agriculture. A presumably typical teacher in the French Vaucluse taught in just that way. First, she would introduced a principle to be memorized perfectly. Then she presented a concrete example concerning it. Next were discussed other illustrations of it until the student could quickly recognize the rule. Only now would the instructor move to the next principle. Thereby, the student was being taught to analyze a future problem by seeking its fundament (L. Wylie 1964:181) -- as opposed to the Yankee approach of trial-and-error pragmatism so often seen by the present author. The Vaucluse approach was platonic, not darwinian.

Another format of deduction is the legend. And agriculturist folktales are no mere adult entertainment. Rather, they often type-cast juveniles as the stars, and so involve and educate the hearers (Pettitt 1946:61).

Since land conditions remain quite stable, a goal of plow-culture teaching becomes stability and repetition. Learning was by rote among the Indic farming Rajputs:- Onto a whitewashed slate, a teacher would trace letters with a pencil. The children would ink over them, then chant the multiplication tables (Minturn and Hitchcock 1963:297-98).

Similarly, an economically static town of Colombia's Cali Department equated religiosity with catechism: "When he is 10, a boy usually knows more about religion than he ever [later] will." Rote taught him Catholicism: "Who is God, Our Lord?" - "God, Our Lord, is a Being infinitely good, wise, powerful, just, the beginning and the end of all things" (reported by M. Richardson 1970:63).

Semester Plow-culture enculturates gradually. It passively makes allowances for individual differences -- in contrast to mass-production. Thus, even the attitude of the Swiss psychologist, Jean Piaget is, as we gradually argue, a preindustrial one of passivity: 'Await the child's budding to the appropriate maturity for reaping.'

The requirements of natural plant growth determine the enculturative schedule. Item: The heavy-work period in southwest German farming was 1 May to 1 November. But

the hilly terraces were so steep as to endanger the young child who might elsewhere have been brought to the fields with its mother. Probably for that reason, the nursery operated during that time period (R. Warren 1967:42).

The simplicity of farming obviates the need for prolonged schooling. From the Middle Ages to the 17th century, European children went into the adult world at about the age of 7-1/2 (Coles 1964:326 ff., in M. Goodman 1970:68).

Yet the charms of the countryside outlure even the small amount of formal education that is often offered. Farming families are shocked and bored by its regimen. In India, the Rajput child leaving for school frequently didn't get there. Unmonitored by his land-owning, field-working father and his purdah-restricted mother, he normally played hookey 30% of the time (Minturn and Hitchcock 1963:299).

Knowledge-Input System Like most of its crops, agriculturist feedback is slow but sure. Everything is likened to seed and life. In a fairly common conversation in Yucatan (Mexico), for instance, two peasant women where overheard conversing about the soul. Dona Francisca argued that it is the immaterial life and personality, bequeathed by God. But Dona Tereza declared it to be mere breath, ceasing at death (Redfield 1954:1955:26). One hardly hears such topics at a Wasp supermarket's junk-food counter!

If agriculture is stable, it easily interrelates school-leavers and beginner farmers. In many societies (and until recently in the United States), youth often willingly vacationed from the dullness of school to countryside harvesting. But that socioeconomically useful combination has been eliminated in "high-tech" by the combination of automation and low farming prestige. Few farm children still dream of imitating their parents.

In that way, a southwest German agricultural village recently invaded by a factory reported the plans of 32 eighth graders. The 12 boys were beginning their escape vocations as follows: 75%...Two or three years of part-time vocational school combined with apprenticeship: automechanic (25%), salesman (25), farming (17%), miscellaneous (8%). 17%...Two-year intensive courses in commerce and business-machine repair. 8%...Three-year course leading to intermediate-school diploma. 100%, Total.

And the 20 eighth-grade girls were destined as follows: 15% for full-time schooling (as for schoolteacher). 30% to home-economics school. 5% to nurse-training. 50% to apprenticeships: 15% for hotel-maid; 10% for hairdresser; and 25% miscellaneous. 100%, total (Warren 1967:86-87).

Hidden among the foregoing figures is the fact that only two of the 32 students planned to enter farming, the village mainstay. Perhaps plan-changers and dropouts would replenish the generational ranks. But it seemed doubtful that industrialization would proceed rapidly enough to eliminate the farm-labor needs and create the commercial-industrial needs the students expected.

Variation In Angloism, the growing anti-farm prestige system was causing some labor shortage by postWar II. But the U. S. lacked a peasant class. So it had to fill its seasonal agricultural labor needs with itinerant farm workers. They were persons momentarily, probably to be perpetually, in debt, yet not officially in permanent servitude. They might be residents (migrants) or temporary immigrants (braceros). Such a crop worker could hope only for good weather; in a recent year, he worked but 131 days (Edwards 1960:16). As for social acceptance, he could hope only that many gasoline stations might permit him to use their rest rooms!

7. THE HERDING CULTURE & LEARNING

Here, then, is agriculture. But many plant cultivators, whether agricultural or horticultural, supplement their economy with animal care. We have divided the plants from the animals merely for explanatory clarity.

Definition When an animal rather than a vegetable is domesticated, the process

is herding or pastoralism. If additionally the animal's coitus is controlled, there is breeding or stockbreeding, whereby the offspring's genetic input is governed. There are as usual many specializations; for example, the controlled breeding of fish, as in hatcheries, constitutes pisiculture or perhaps mariculture.

Useful and usually large four-legged domesticates, such as sheep, horses, bulls, and water buffalo, constitute cattle. An adult male, castrated to make him placid, is an ox.

Aimless wandering of humans is termed nomadism. We suspect, however, that the nonfixity of the roaming is due merely to unsystematic observation. More importantly, transhumance is the seasonal movement of livestock and their owners, as through a series of ever-refreshed grazing lands; it is, broadly, a regularized circuit. By contrast, migration is permanent one-way movement.

Evolution The difference between undomesticated herding (called hunting and discussed above) and domesticated herding, is one of degree. In a rich environment, hunting randomness changes to resemble cultivation regularity. Thus, around the warm Japanese Current, humans could systematically reap animals or fish or fish they hadn't planted, and do so confidently. Of such a phenomenon, the Northwest Coast of North America is a prime exaple. Fish were so regular that they furnished a "crop." And the responsive human situation evolved (unlike most besticultures) complex social organization, including chiefs. Those hunters would better be classified as herders. And in contrast to the abandonment suffered by nonproducers from marginal hunting/foraging societies, the Haida of British Columbia sustained old people (cf. Jacobs and Stern 1962:134). Such enthnography reminds us that altruism is not a matter of 'human nature' alone, but also of Darwinian adjustment.

Again, hunters may catch young animals while momentarily enjoying adequate meat. Then may corral or even make pets of them.

Hence herding is a form of mutualism or symbiosis, that is, the relatively permanent association of two species (man and cattle) for mutual though not necessarily equal benefit. We find simple forms of herding conducted even among some animals. Thus, the ant Lasius brunneus and the plant louse Stomachis hit it off: Hair surrounds the lice's anal region, so it cannot remove its excrement. The ants do so as their food. In return, the ants protect the lice against enemies, and provide them with earthen roofs. They safekeep the lice eggs in their anthill chambers over winter, then carry the hatching larvae to the plants for spring feeding (Eibl-Eibesfeldt 1970:302-302).

Hunting is crude in comparison with the advantages of animal husbandry. Since the domesticates are near and fixed, hunting's energy costs are eliminated. Keeping flocks close ensures their availability for food and hides. And it presents byproducts like blood, milk, and honey. Thus, halibut are grown more cheaply in English marine hatcheries and pens than fished catch-as-catch-can in open sea (American Society of Agronomy 1965:38).

Since a protected beast need no longer be 'streamlined' for immediate combat or fight, it can safely develop variations. The dense, curly wool of sheep for example, is not "natural" (feral), but a byproduct of selection under domestication.

A further refinement of herding, where practical, is to deliver feed to the herd. This courtesy eliminates its trampling the field growth or uprooting vegetation while seeking stalks. The system, stall-feeding, also makes possible the year-round maintenance of animals in a climate where the outdoors blossom only seasonally.

Livelihood Because cattle can be moved and propagate themselves, an animal economy is often more ecologically stable than cropping, especially monocropping. Herding puts "fields on the hood." But there is ecosystematic advantage in mixed farming, or simultaneous domestication of certain plants and certain animals: Sudden plague or drought cannot eradicate all energy sources. Hence the usual human diet of both vegetables and met well befitted the early immemorial scheme of mixing.

A classic herding (combined with some slight cultivation) may be studied in the uplands of East Africa. There a Sudanese group, the Nuer, numbered one-third million, or 5-1/2 persons per square mile. The group held about two cattle and one sheep or goat per couple. Moving to exploit the diverse topography, they would drove the cattle to dry-season camps in November, and to wet-season villages in May. Considering their disease-ridden ecology, the Nuer husbandry was superb (Evans-Pritchard 1940:36).

The complexity of befitting seasonal changes makes pastoralists conservative. Such breeders as the Pakot of western Kenya strongly resisted innovation (Bascom and Herskovits 1959:164). But we must reinterpret that 'characterological' statement ecologically, to mean that they may have found it easier to change their environment, to migrate seesonally, than to adapt themselves to disease or other unsuitability.

Again, Kenya's Masai were popularly considered "irrational" for their enthusiasm over the scrub (nonscientifically bred) herds, in contrast to their neighboring Kikuyu farmers. Yet nutritional analysis found that the superior diet of the two was that of the Masai (Merrill 1960:122-23). For if breeding cannot be controlled, as where animals must forage, scrub varieties fare best.

Hunting, especially of larger animals, involves perishables and tends to be communal. But herding, involving capital, tends to be privatized. Herds can occupy spaces of wide variety, in contrast to the standardized conditions of farming a given crop; and so herders can easily develop socioeconomic differences. That very mobility creates problems. There is a constant conflict between herders and farmers. The frequent interaction of nomads (cf. herders) with fixed residents (sedentes, cf. farmers) may be masked as hostile raiding between them (e. g., Sweet 1965). To the anthropologist, however, the predation may simply be forcible 'marketing' of the specialty products. In the U. S. musical play, Oklahoma!, the dispute appeared as a song which pleaded that "farmers and cowmen should be friends?"

Association Pastoralism forces mobility, limiting owners' personal goods, and favoring decision-making decentralization. Herding societies tend to hold a kin group responsible for the actions of each of its members in "joint legal liability." Such balkanization of pastoralism in comparison with industrialism probably helps explain why the Middle East's postWar II wars found the Arab nations constantly bickering rather than cooperating against their foe, Europe-modeled Israel.

The frequent need for transhumance recommends the effacement of boundaries. Hence distant kinship and descent schemes are latent, even though inactive much of the year. Cattle cultures often favor a new couple's living near the groom's parents (living virilocally) (Ogburn and Nimkoff 1958:586).

Herding, especially of large animals tends to be men's work. Women are needed for traditional domesticity. Where land is abundant, as was the case in East Africa's Nuerland, parenthood is pressured. A marriage there was legitimated, in fact, only with a birth. But even a barren woman could play bridegroom, hiring a male to impregnate her new wife (Evans-Pritchard 1951:91).

Ideology Most herd animals find sufficient forage only by dispersion. Hence their herdsmen must spend much of their time in small groups or alone. Yet they must coordinate with larger groups, both seasonally and for defense accepting orders. So the pastoralist develops a personality of "aggressive militarism." He accepts risks, and becomes brave and resolute, undaunted by pain or hardship (Goldschmidt 1965:1968d:241). In western Kenya's Pakot, we typically see herders who were typically individualistic, truculent, conservative, and proud (Bascom and Herskovits 1959:161).

Ecology, then, helps pride the pastoralist. He is realistic and "masculine." By the latter term, Goldschmidt (loc. cit.) meant that the ecology favored premarital sexual freedom for men, overt mascualinity (cf. machismo), many wives (polygyny) per pastoralist, and their jealous proctorship. The great social value of obtaining a

wife is expressed in such herdsman institutions as bride-wealth and male sexual anxiety. It leads to interseual aggressiveness rather than affection (ibid.).

Even if the economy includes vegetable domestication, disproportionately great prestige attaches to cattle. That 'irrational' ideology can probably be rationalized by the herds' greater maneuverability than the crops'. (This "Daryll Forde Effect" is discussed earlier.)

Logic The cultural emphasis on the beasts (rather than in, say, human sexuality) was sloganized by Evans Pritchard (1940:16) as, 'Solve problems by looking for a cow [not a woman]' -- "Cherchez la vache." Consequently, many such societies worship some version of Ba'alim "to increase the productivity of the lands and flocks (hence, the God of Production)" (James Pike 1960). The stockbreeding logic is, in a word, Ba'alism.

Enculturation The foregoing structures, differentiating animal domestication from plant domestication, likewise affect cultural transmission. The fixities of complex-culture schooling, like buildings and tables, are impractical for much of pastoralism. Such mobile arrangements as trailers must be used even when a wealthy or powerful larger culture superintends. But in simpler socieities, the school system itself goes pastoral:- Although most Somali lived in nomadic bands, bush teachers (wadaad) wandered from camp to camp in that northeast African culture, holding class in prayer and verses from the Koran. Thereby they taught some reading and writing of Arabic (I. M. Lewis, discussed in Herzog 1962:304-05).

Student implication is that the youth can perform many pastoral chores, but can importantly be used around large animals only if they are relatively placid (as through the animals' prior castration). The Galician Ukranian child of eight would run errands carry his father's lunch to him in the distant bush, ride horses to water, drive cattle to pasture. Hence children meant additional working hands. And by 12, the herding youngster already performed practically all adult tasks (S. Koenig 1939, in Newton 1967:157).

Curriculum in a pastoral or frontier situation is diffused. "There was little need for formal education," remonstrated George I. Sanchez (quoted in Ulibarri 1958:37) about the Mexican North America of a century or two ago. Religion was taught by priests and parents. Literacy was taught by the priest or the local scribe. But there was little to read. Most communication was oral. There was no marketing, so weights and measures needed be only approximate. Even public office required mere common sense. Only the priesthood necessitated formal training. As a result, Hispanic culture developed little interest in formal education, and has been somewhat skeptical of book-learning (ibid.).

Specialists are few; pastoralists must be generalists. Like the above-mentioned priest-apprentice, they undergo rigorous and spartan curriculum. Thus, when a Navajo youth was training to become a medicine man, he first had to spend hours auditing or singing sacred songs before being allowed the fun of horseback riding or practice-shooting (Carlson and Witherspoon 1968:74).

Now, cattle-herding demands responsibility, because each beast's great economic value may vanish in a brief accident. Hence pedagogy emphasizes dutifulness. To train a child toward his own sheep flock, a Navajo father might commemorate his son's moving to his older sister's house by gifting him the lamb that had theretofore been merely loaned as a pet. Again, to train the lad in horsemanship as well as horse care, a father might separately gift a pregnant mare ready for delivering a colt (op. cit.:47, 58).

Semester As for the enculturative duration, ones notes that the herding-culture youth must early learn to make and effectuate decisions, as in assessing grass and water conditions while his flock is moving. Hence his actions are culture-monitored from earliest youth. For that purpose, legends are often recounted to sanctify their lessons. In Navajoland, for example, an uncle told his bedded nephew of a hunter lost

in a storm and allegedly saved by a campfire built by bears (op. cit.).

We may interpret that tale as the older generation's teaching the younger generation ecosystem, that is, living in balance with the natural environment, by cropping only what one needs, as well as with neighboring cultures (e. g., Pueblos) and with one's own group (Navajos).

Elsewhere, stockbreeding may be only an auxiliary activity. Then many of its duties can be directly assigned to children. In South Africa, Schapera (1930, discussed in Newton 1967:157) found that wealty native would assign a cow to each child. Twice a day, that beast would be milked by the Hottentot tot.

Again, mid-afternoon in a Vaucluse (French) village found only the youngest children allowed to play. As after-school chores, the others had to carry water from the public fountain, and armloads of wood from basement to street storage. Then they'd gather grass for the rabbits and chickens, or mulberry leaves for their voracious domesticated silkworms. Only after then completing academic homework, with the clock reaching 6:15 p. m., could they dash to the streets to play. Even then, the older girls had to invigilate their younger siblings.

Nor were the Vaucluse ruralities exempted. They substituted or added field- and garden-work. They would watch the bleating sheep or goats, both droving them and milking them (Wylie 1964:1970:177). To paraphrase an adage: Hunters work from sun to sun, but herders' work is never done.

How do stockbreeding societies reintegrate the 'graduating' learner? - This process depends on the type of animal. For herding ranges from cattle weighed in tons to silkworm pupas that may be wafted off a scale by a mere breeze. A flock of sheep, for example, can be grazed by fewer herders than a band of large catle. Probably for that reason, a cattle culture tends to teach much communality and spartanism. Consider the cattle-tending Ngoni of Malawi. There in southeast Africa, a boy would be conscripted to lodge in a dormitory. It would be located near the village cattle corral (kraal). He there learned communal life with his age-mates and obedience to his elders. Even after tribal wars had been suppressed, that kraal system persisted. The younger boys became fags, helping seniors seduce girls. The lads were fed from their mothers' households, fetching their own and the oldsters' meals. The life was rigorous. The newcomers learned to defend themselves [rather like new chickens learning a peck-order - H.G.B.]. At the same time, they were escaping the remaining women's world, and were fringing the men's. The adult males would sit and talk shop at the kraal gate. If quiet, the dormitory youth would be allowed to listen. Hence the kraal system proved adaptable as a knowledge-input scheme (M. Read 1959:1960:92-95; 1968:50).

Variation The division between hunting and herding depends in part on technology -- the ability of a particular culture to control a particular animal. There are many variants. One concerned a New Guinea people. They kept pig herds semi-domesticated, feeding them only enough to reduce but not eliminate their foraging. As the herd would multiply, it would invade more gardens. Then the relationship of pigs to people changed from mutualism to rivalry. The result would be a pig-slaughter feast, and the signal for aggression into neighboring humans' territories (R. Rappaport 1967:1969:193-94).

Again, animals may provide subsistence variously. The chicken furnished protein when alive from eggs, when dead from its body. But an animal could also transport its owner to kill other bodies, as in the case of the Plains Amerindians' domesticated horses that could overtake undomesticated buffalo. Herdings, then, have some qualities in common, but others that depend on finer analysis.

8. SUMMARY OF HOW A CULTURE'S LIVELIHOOD-PROCUREMENT MODE INFLUENCES EDUCATION

From the foregoing variations, we find that the system of normal enculturation must be detailed and understood in far greater measure before proposals can be entertained for its alteration--for "reforming" learning institutions. And so we here change the heretofore-pragmatic, or Boasian, approach to an emphasis on causation. Instead, "Ethno-Logic" offers a cultural-ecological, cultural-materialistic, analysis of learning.

Thereby we move from the prior approach of natural history, or idiographics, toward a paradigm, toward "nomothetics." And that is in accord with the general progress of science.

A society's energy-processing requirements determine such social factors as the closeness of settlements. The need to sustain such groupings fosters ideology. This customary three-way analysis (livelihood-association-ideology) is here supplemented by fourth and fifth items of the effect end: logic and mystique. And the economic production of potentially rivalrous communities determine the bottom rung. The resultant ethnic ideology in turn determines whether the normal community logic will be rigid (rote, catechism, reckoning, etc.) or exploratory (e. g., the modern logic called heuristics).

Yet the course is not entirely free. For, as followers of Marvin Harris argue, the response actually chosen to each cultural challenge is eventually reckoned by the energy it thereby harnesses from (or wastes to) the environment. A culture is, then, a "flywheel" that evens energy out over great space and time to optimize its energy utilization. And so cultural materialism furnishes a key to human learning.

So this manual begins a codification of education-and-culture. Using peculiarities (idiographics) to induce principles (nomothetics), this work enables both education and ethnography to leap forward into a science of ethnology.

Youthful prestige seems to increase with environmental felicity, decreasing with environmental hostility. Energy procurement modes may be divided into two major types: parasitic foraging (plant-foraging and animal-hunting) and domestication (hoe culture, plow culture, and animal-herding). A society tends to specialize in a single procurement mode. One exception is that many cultures tend to manage both plants and animals, whether at the level of parasitism (producing hunting-and-gathering) or of domestication (cultivation-and-herding). By attempting further diversity, a complex culture faces difficulties.

There are at least six major means of harnessing energy, from the foraging of vegetables to the application of modern fuels to tractorized agriculture. In each, the livelihood mode ultimately controls association, ideology, logic and mystique. And the structure of each extends to all aspects of education. Thus, shallow (hoe) cultivation requires less investment than deep (plow) agriculture. Consequently horticulture inculcates less patriotism than does agriculture.

The plant-foraging and mineral-foraging (= simple mining) culture depends on nature. Hence it is somewhat precarious. Its open resources discourage ranking and emphasize a fatalistic harmoniousness. The grubbing child is surrounded by his curriculum in the form of the quest area. From earliest childhood he particpates however haltingly in the economy. Adaptively, the ideology that arises is a mildly active expectancy toward the environment, a latescence.

The hunting-culture child may gradully participate if the game is small. But if the quarry is large animals, he must be given distinctive apprenticeship, as through adults' wounding an animal so that he may learn to deliver a fatal blow. He also comes to understand bravery legends. His display of the hunter norms in real chase or war may be prerequisite for manhood initiation.

As humans identify plant-foraging sites and weed them, they begin domestication. Gradually selecting the vegetables' most profitable genetic mutations, they protect them by hoeing, whose economic mode constitutes horticulture (cf. gardening). Crop growth obeys the unhurried seasons. The society becomes a sociable one, with tasks

accorded to all classes, and an ideology of stoicism. Even the youngest can simultaneously perform-and-learn. Knowledge is cumulative and permanently useful, so prestige goes to the elders. Traditional belief outranks curiosity. Only a few specialists are needed.

Hoe-culture is limited by the depth to which its plants can sink their roots. Deep-hoeing, as by plow and cattle and/or irrigation, overcomes that limit, and constitutes agriculture. Thus the plant harvest of the Great Plains hoeing probably increased 100-fold with the invading European's plow system.

The logic of agriculture is the traditional, biological model of the plant's life-cycle. It emphasizes the crop-like maturation of individuals, as in Jean Piaget's mental-maturity sequence legend. Particular crop conditions determine the enculturation, through harvest work-times and pressures, etc. The stability of crops and processing modes enables even young children to experience them. Agriculture integrates the learner slowly but surely.

When the domestication involes animals, it constitutes herding. The mobility and vulnerability of animals force shepherds to make quick decisions. Hence pastoral personality and value scheme may become aggressively militaristic (depending on the type of herd). With small animals, children can perform many chores, but are of limited value for large ones. They learn the rugged adult ways, and must motorically prove themselves before maturity acceptance.

Quantitative analysis shows that industrialized agriculture is many times as productive as a hunting-gathering society. These vast differences discredit the "cultural-relativistic" argument that each society must be considered absolutely rather than comparatively to potential rivals. No; there is a constant "packing-down" toward efficiency. This "cultural darwinism" finds the more highly-energized human society squeezing out the low-energy societies. The very function of human organization (cf. government) is the accommodation of ever denser populations. Thus is debunked the current Angloamerican fad called Zero Population Growth (Z. P. G.).

The only durable way to increase the survival of a contacted culture is seen to be improvement in its energy-harnessing efficiency. And the probably easiest way to do so is to apply the findings constantly being "bisociated" ('discovered') by other humans. They may be in the same or outside cultures, and of past or present generations. Hence the future of intercultural stability depends on the quality of learning -- a sly contest between social classes and ethnicities for the occupation of ever greater (not necessarily geographical) living-space. Just as physicians must learn Germ Theory, educators must henceforeth learn Darwinian Theory and Symboling Theory.

Here, then, is an "ethno-logic" interpretation of how human energy-procurement ultimately governs human learning systems. But near the beginning of this paper, we had a tabulation showing that communities must perform several additional functions: energy-transformation, energy-distribution, energy-conservation. And each of those phases has variables which likewise influence the learning system. That is where ethnicity enters in: Each ethnic group differs from its neighbors in some aspects of livelihood, social organization, ideology, etc. Not all are equally efficient; not all can succeed. The most foolish behavior would be to try to imitate another ethnicity, in violation of the Darwinian precept of micro-discrimination by nature. -But that is another matter. (The post-procurement remainder is detailed in Burger [1969-1988].)

In sum, it would appear that this "Ethno-Logic" cultural-materialistic approach illuminates the true nature of human learning better than the myth, still rampant in Educationism, of control by ideology and politics.

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This is a contribution to social science, not social studies. The purpose of this report is to correlate techno-environmental levels with human learning. It is not to provide an ethnography or a history of particular ethnicities. Therefore the dates of the evidence are relatively important; 20 or so years earlier or later would not prove or disprove the argument.

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[End of Dr. Henry G. Burger's paper, "Ethno-Logic"]